The REA Accounting and Economic Ontology – Its Use in ISO 15944-4 and Its Development as a Literary Warrant

by

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REA Overview

- **REA = Resource-Event-Agent**
- **REA started off as a semantic accounting model in *The Accounting Review* (top accounting research journal)**
- **In the enterprise (within the firm), it has been used as the basis for newer types of ERP systems (Workday and others).**
- **In the collaboration sphere, it has been used in ISO 15944-4 (Open-edi) as an economic and accounting ontology.**
- **We are currently summarizing and integrating the REA work in a research monograph commissioned by the American Accounting Association (coauthors are Guido Geerts and Graham Gal).**
- **We are striving to establish the AAA monograph as a literary warrant for the accounting domain (thanks for suggestion from Simon Spero).**
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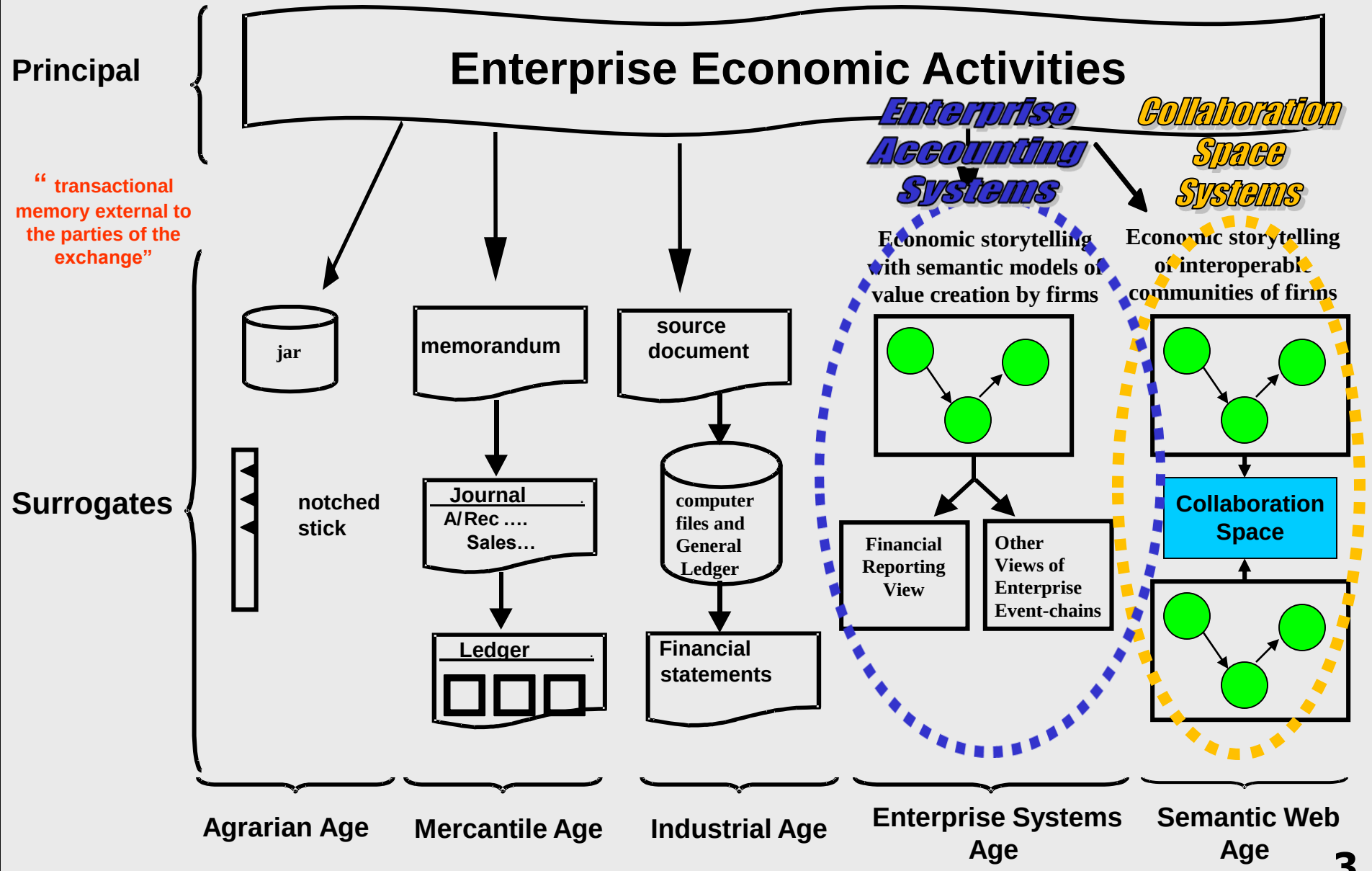
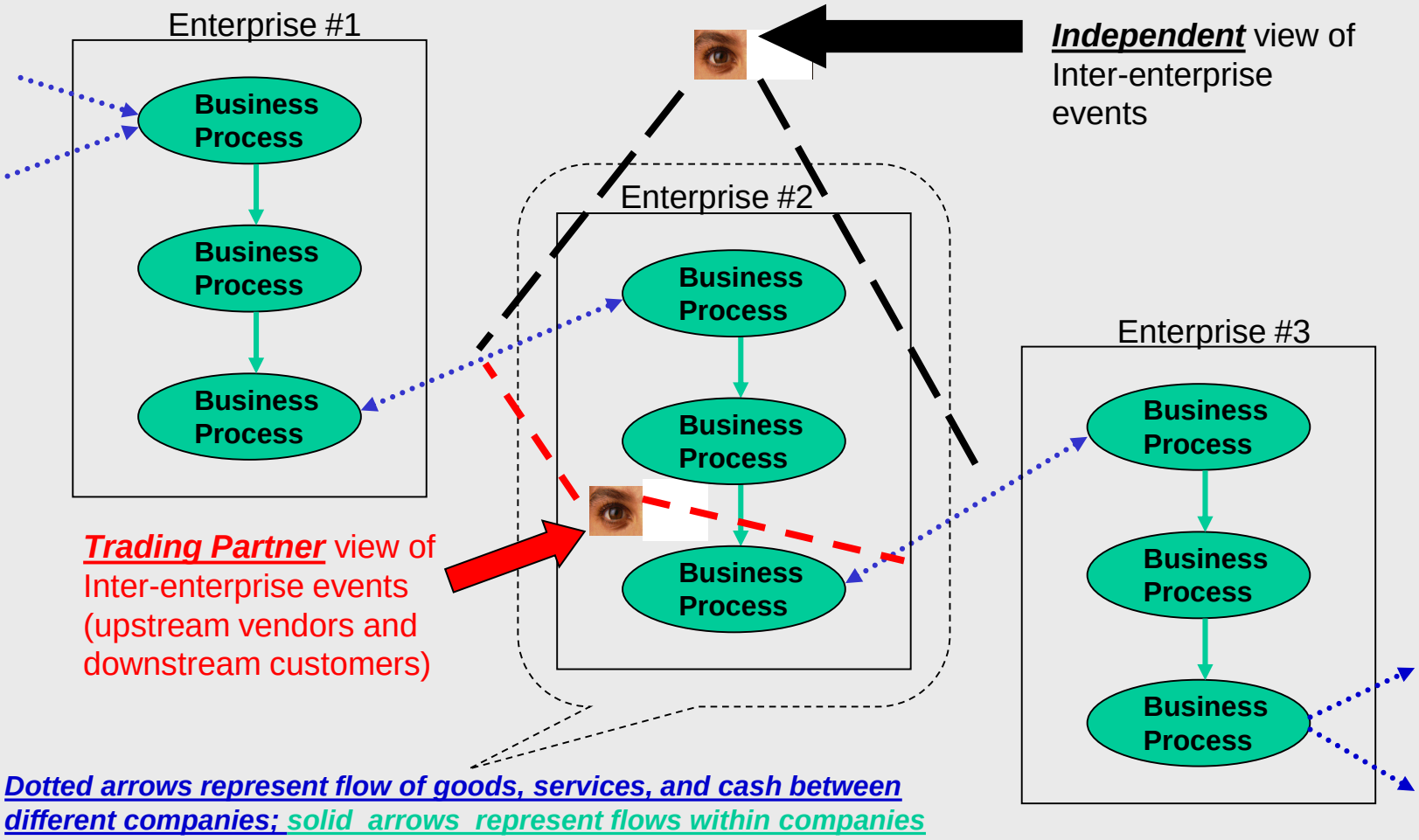
Clare Beghtol (1986)

The evolution of accounting systems



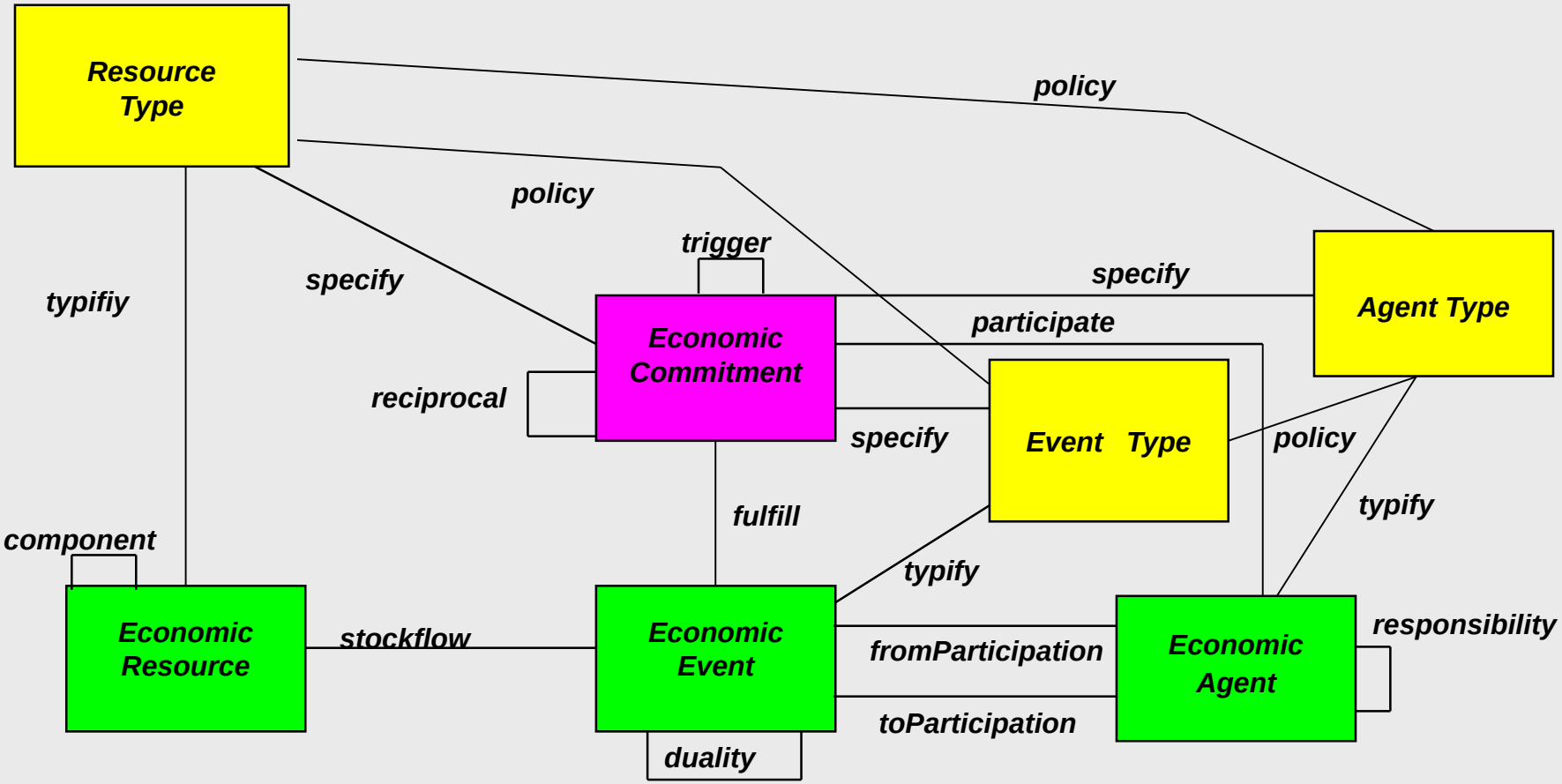
Collaboration Perspective: Trading Partner vs. Independent



Different Views of Business Collaboration (ISO 15944-4)

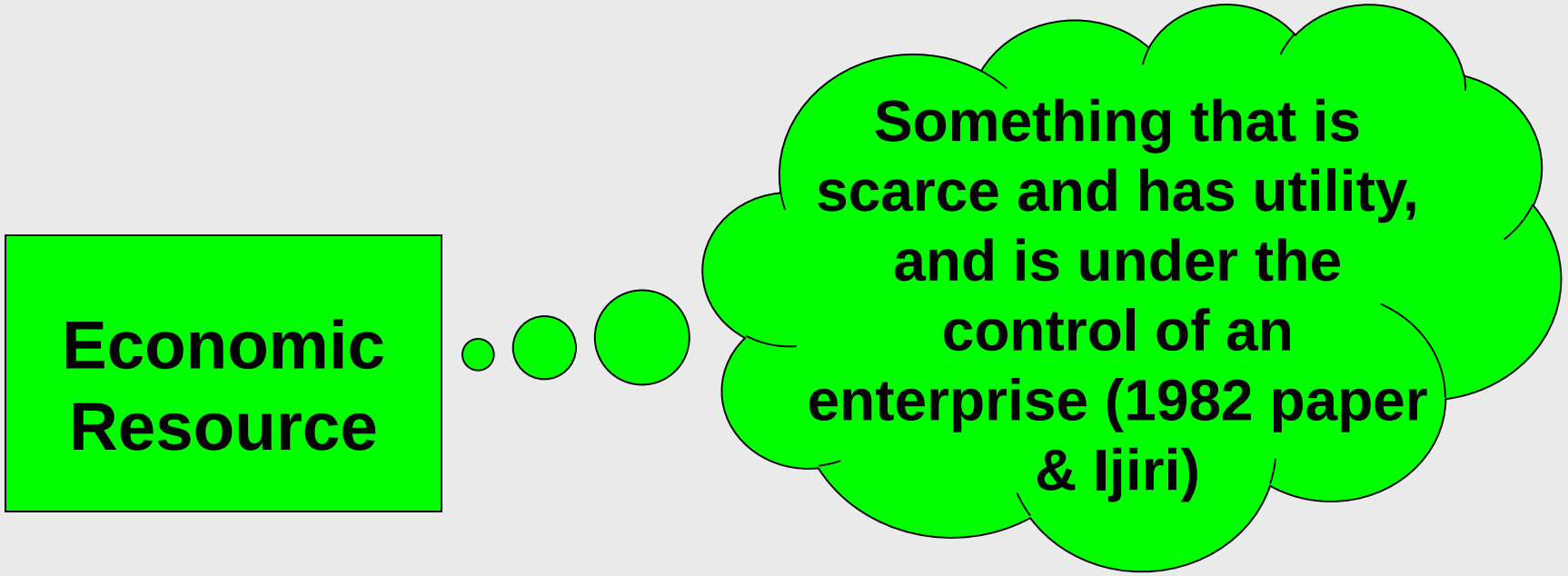
This figure is Japan expert contribution to 15944-4,

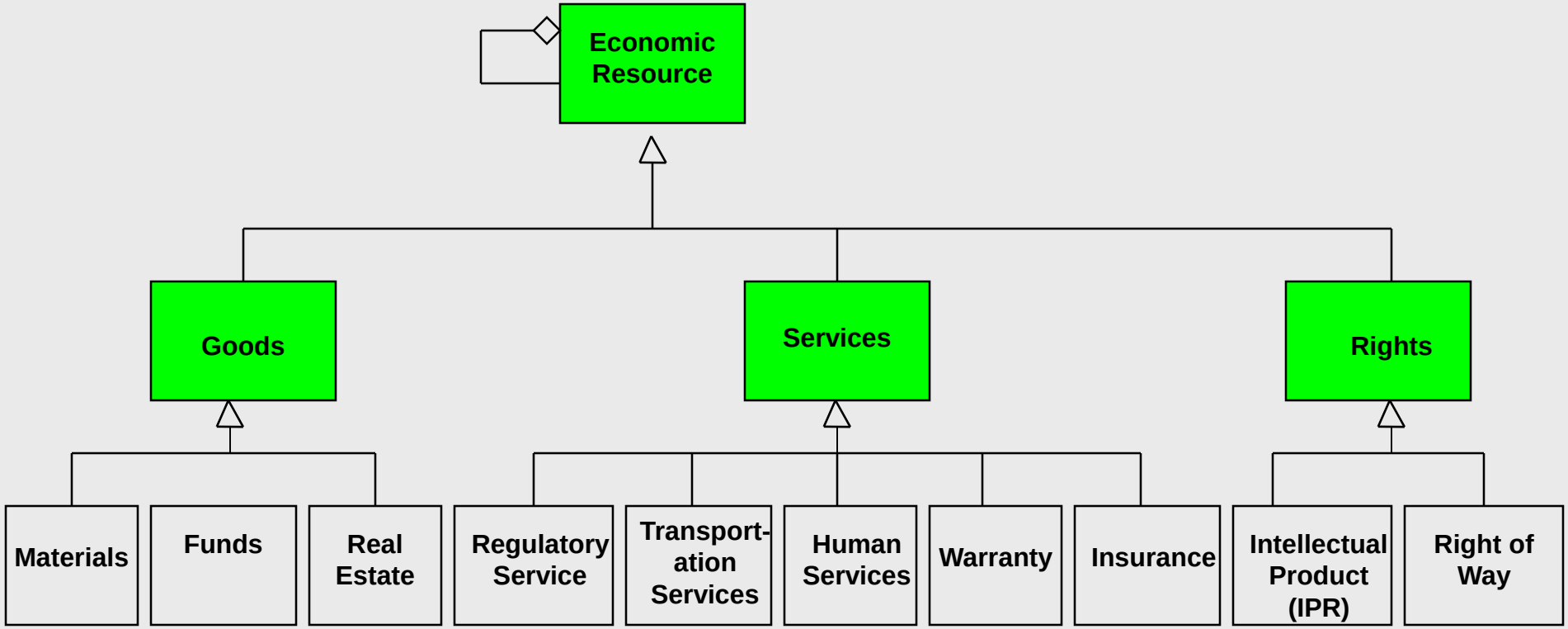
In philosophy and computer science, an ontology is a formal representation of a set of concepts within a domain and the relationships between those concepts. It is used to reason about the properties of that domain, and may be used to define the domain (Wikipedia).



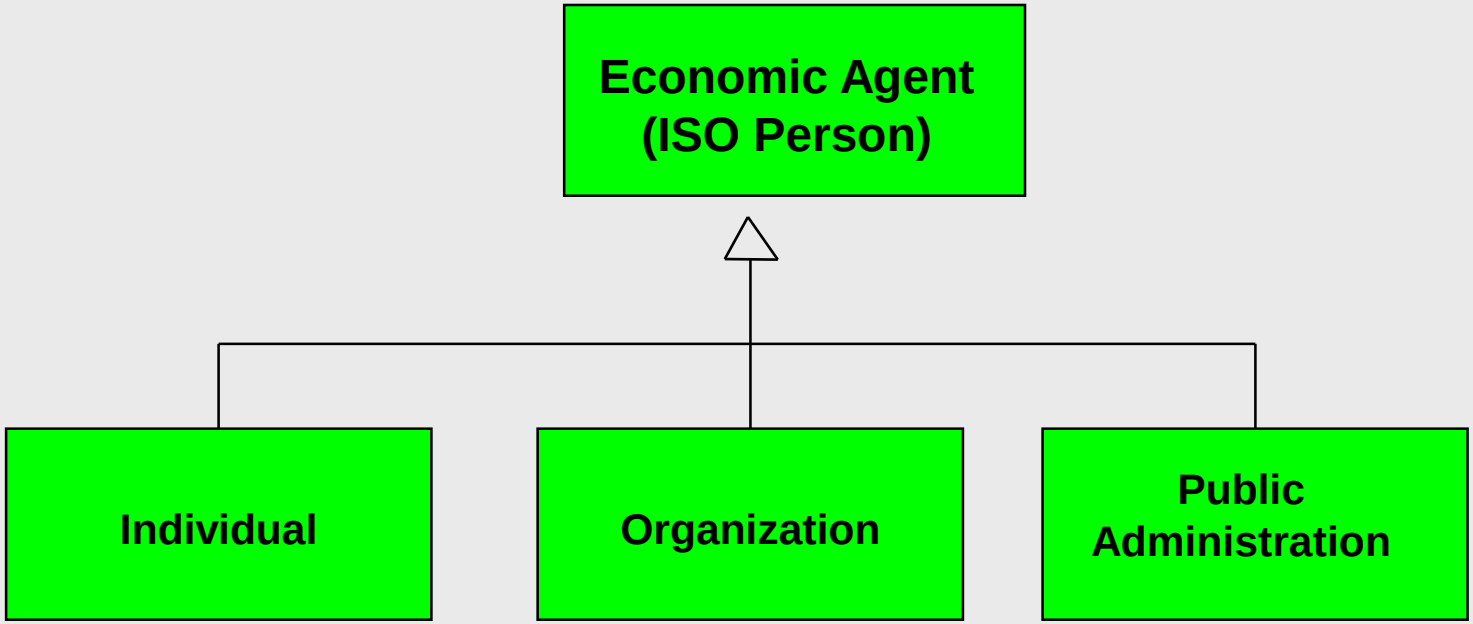
Resource **Event** **Agent**

Key REA ontological primitive = Economic Resource

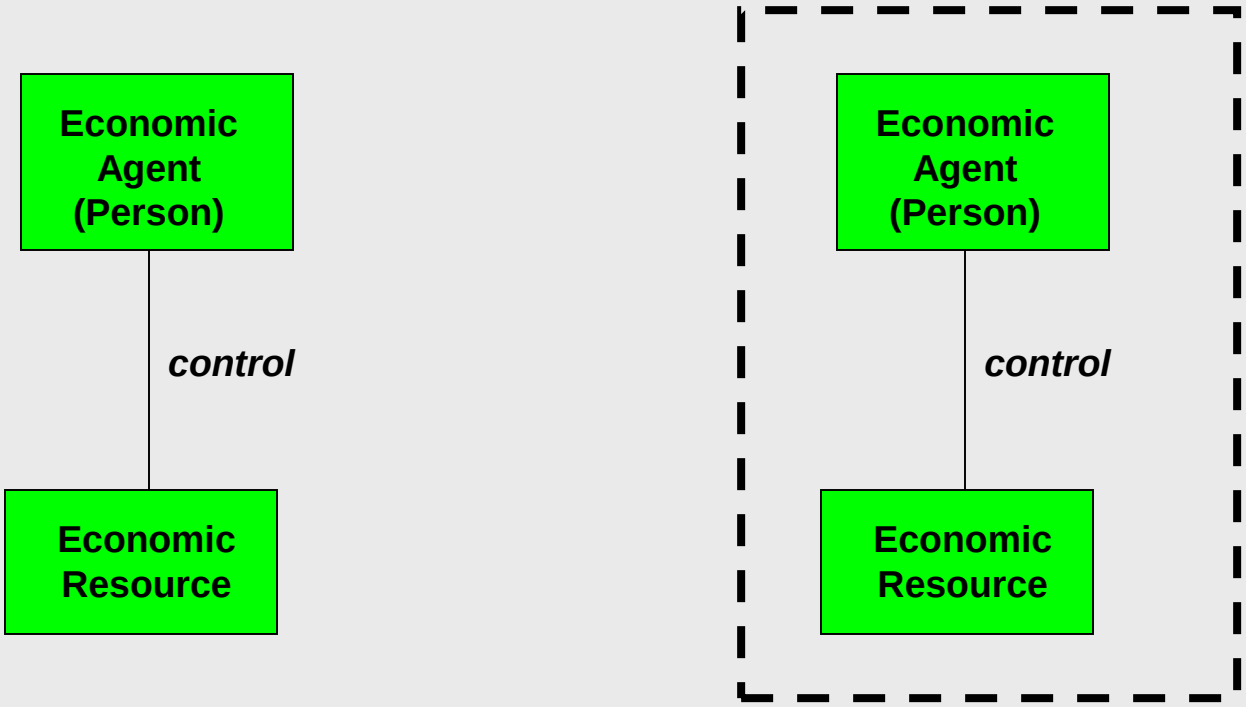




Subtypes (possible) for ECONOMIC RESOURCE (ISO 15944-4)

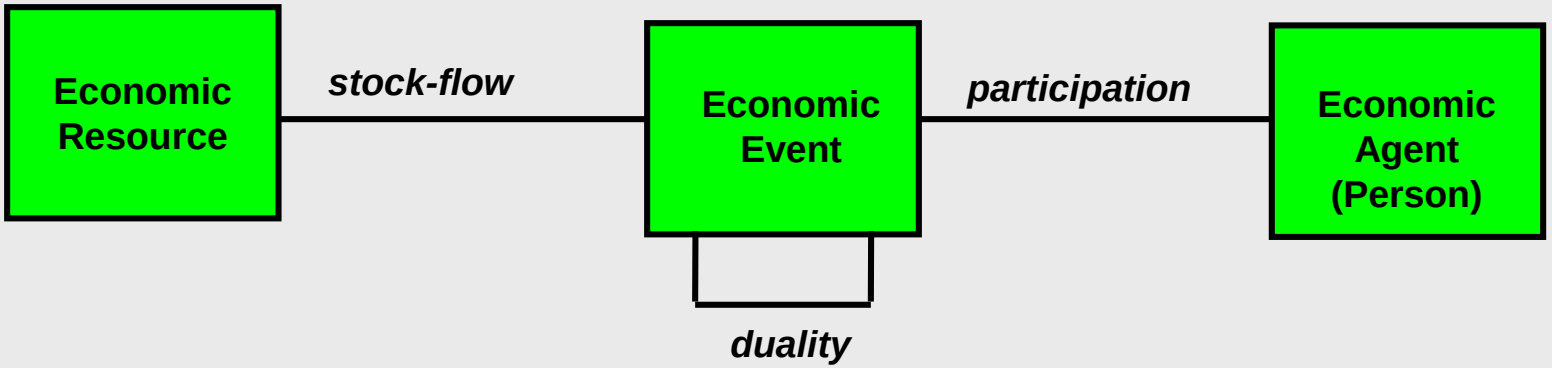


Subtypes of Person (15944-4)



Person and Economic Resource as the Basis for Exchange (ISO 15944-4)

What has occurred



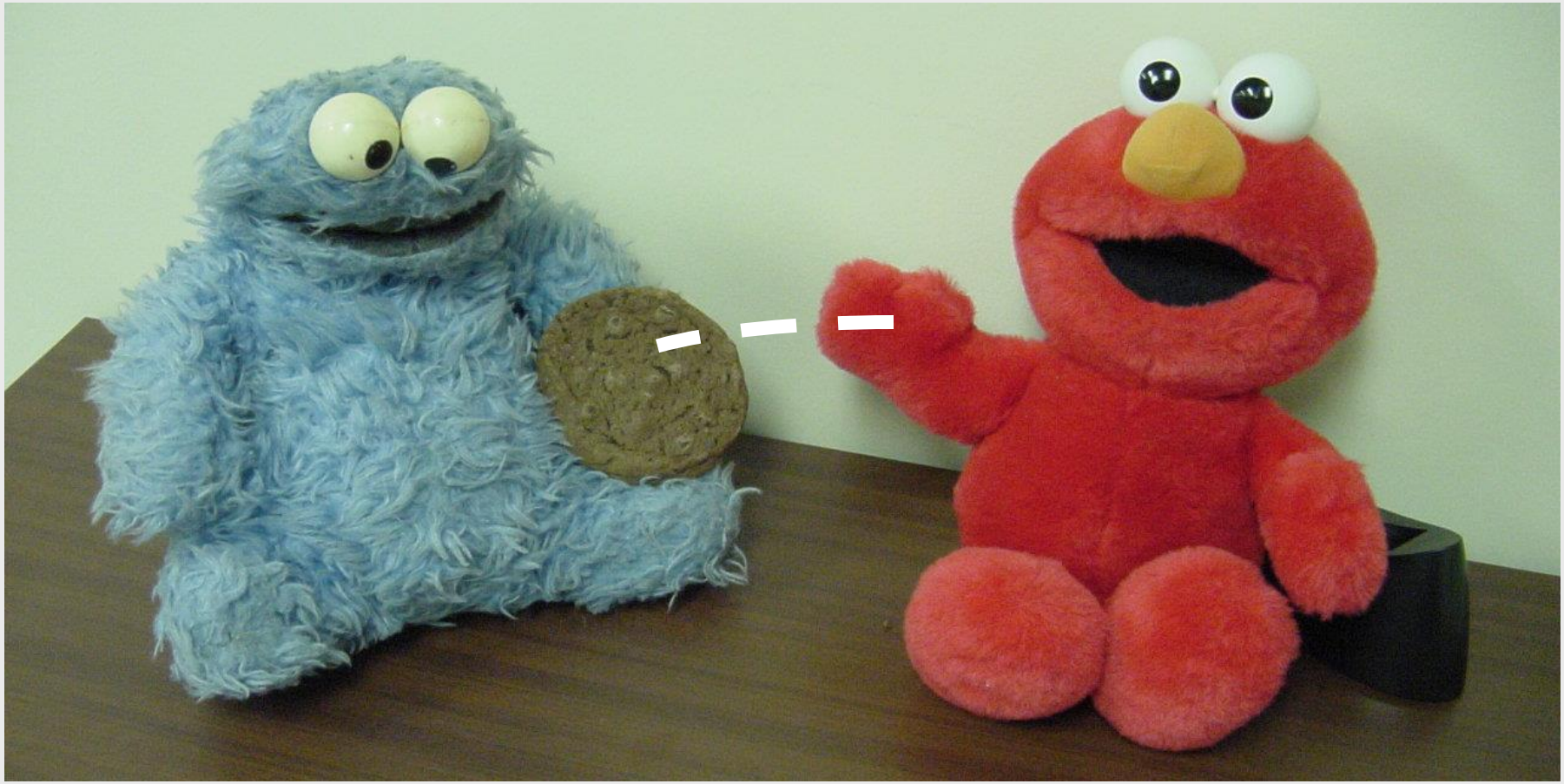
Normative primitives of a transaction ontology

An economic story

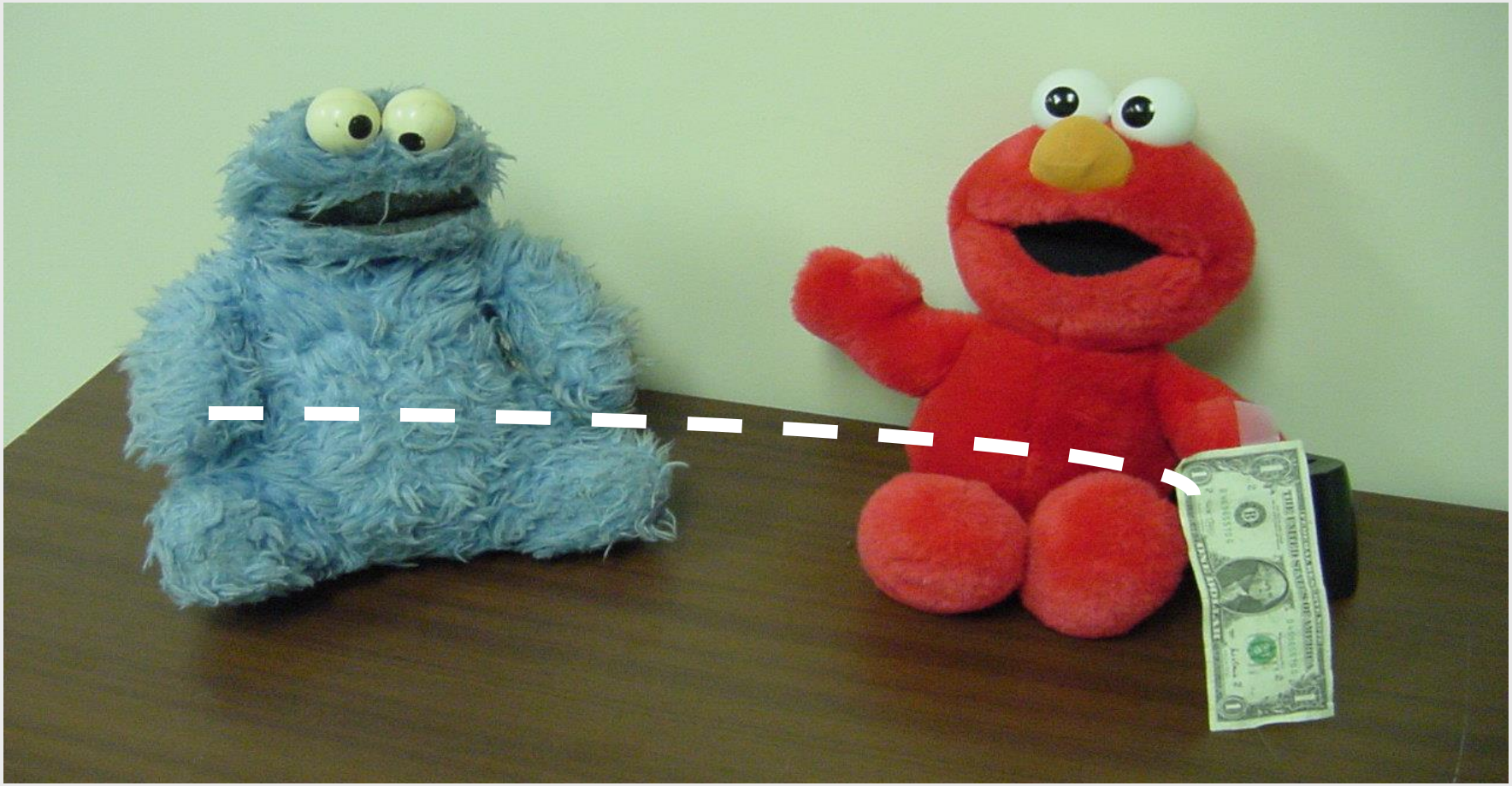
Once upon a time at the cookie store ……

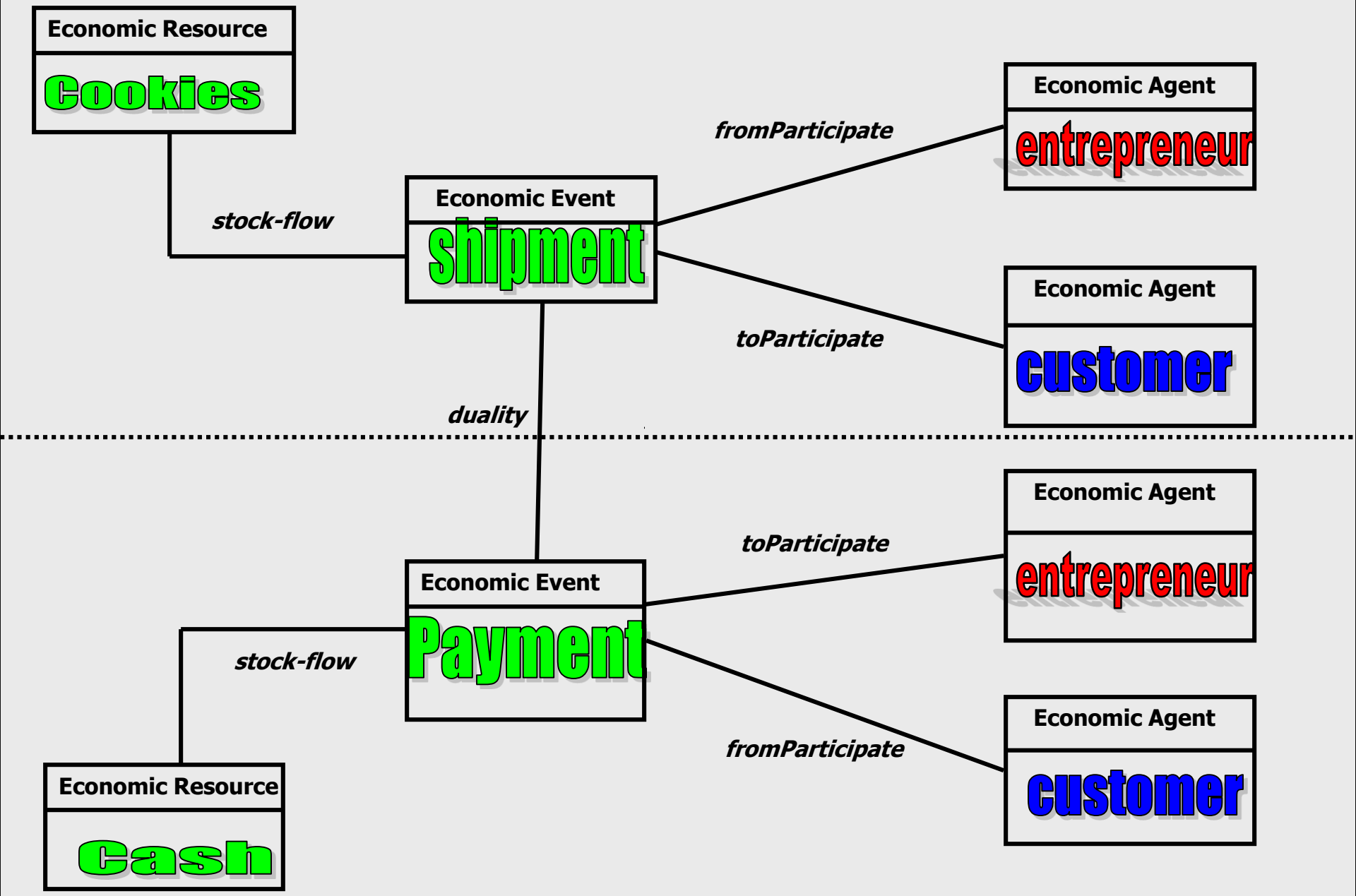
Cookie-Monster (the customer) and Elmo (the entrepreneur) meet in the (real or virtual) marketplace, thus setting the stage for an Economic Exchange

Cookie-Monster and Elmo engage in a SHIPMENT (transfer of Cookie Inventory)



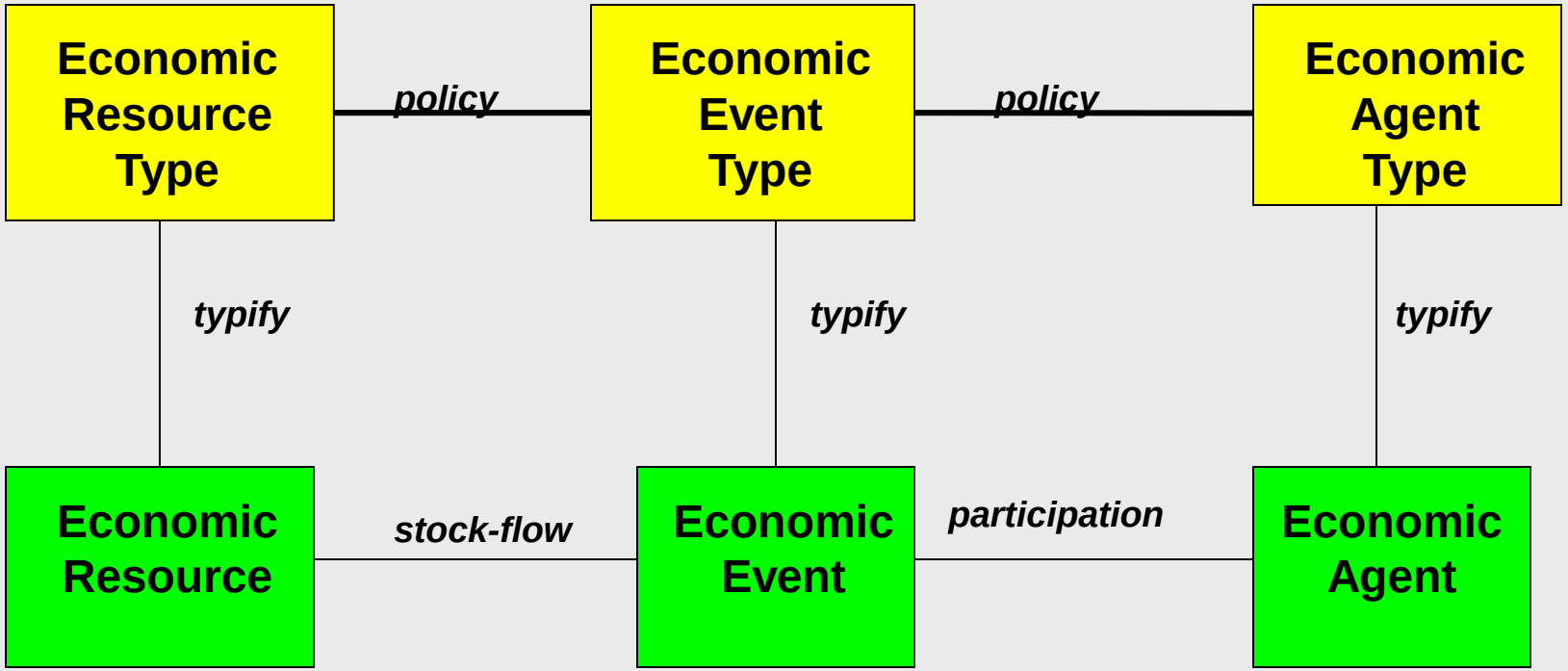
Cookie-Monster and Elmo engage in a PAYMENT (transfer of Cash)





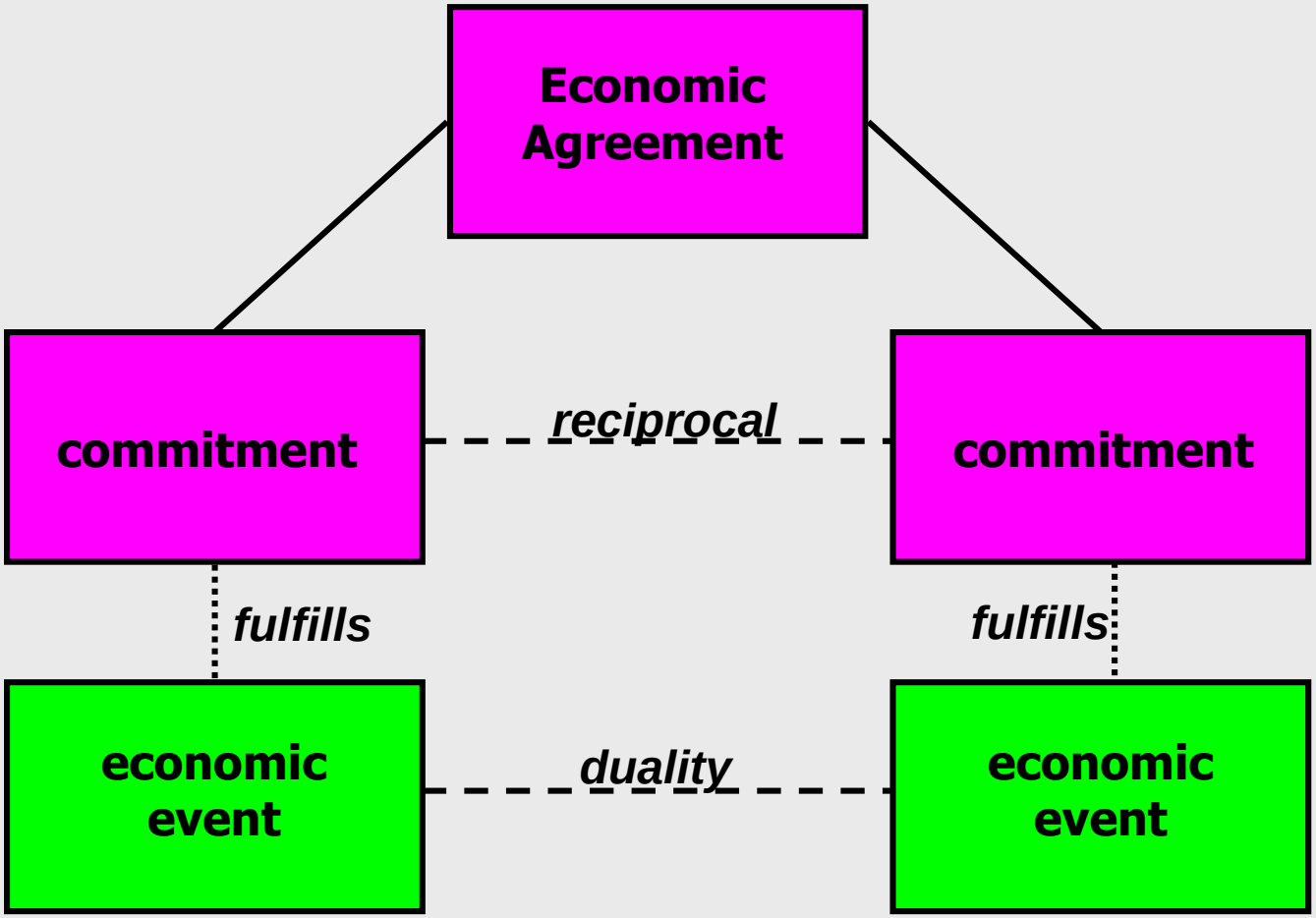
Modeling requited transactions

What could be or should be

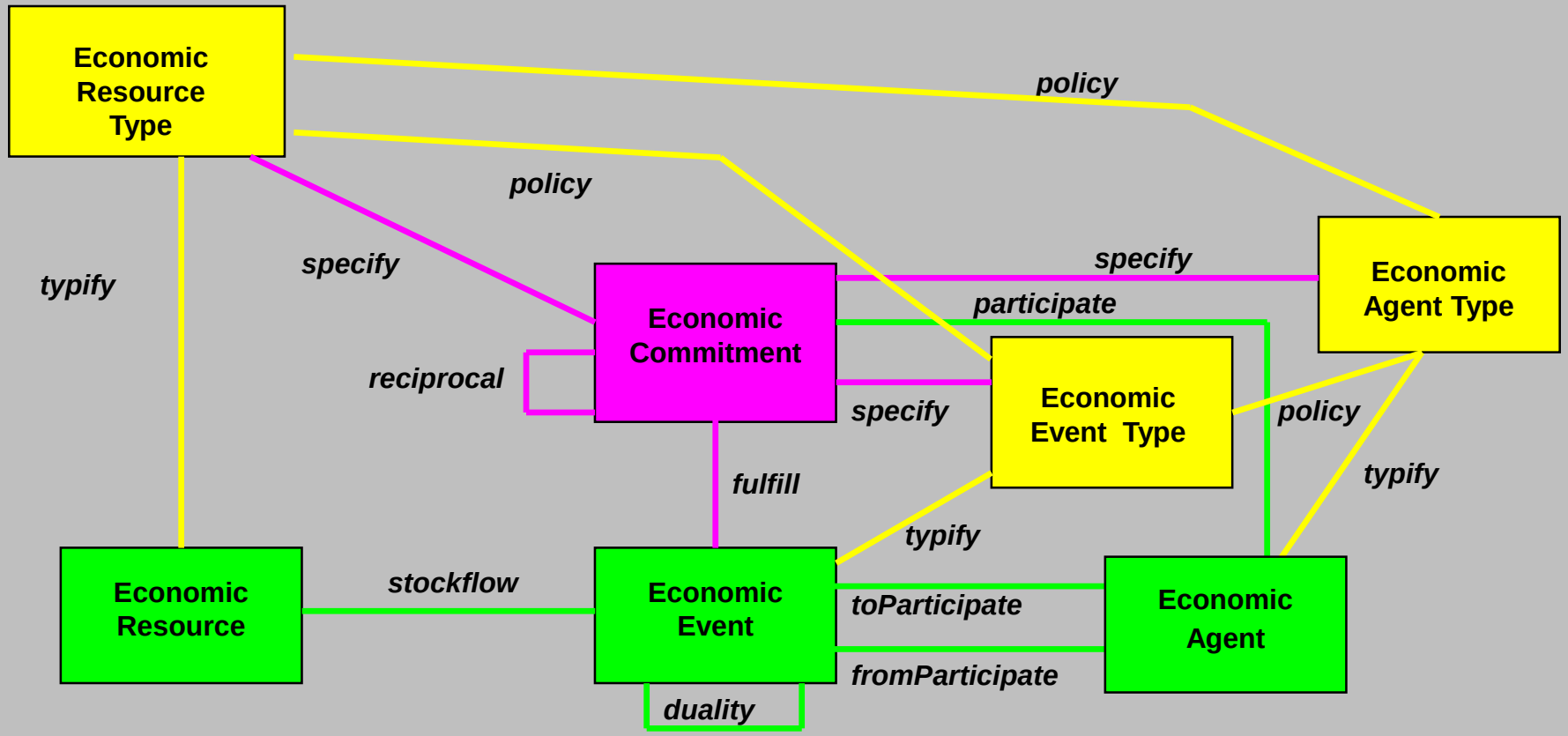


Adding Types

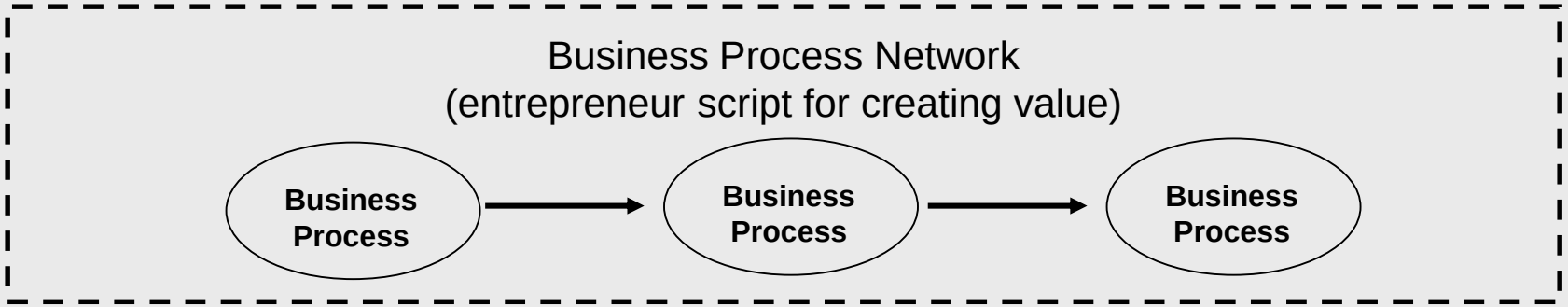
What is planned or scheduled



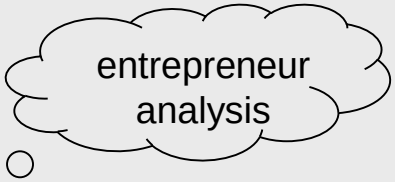
Adding Commitments



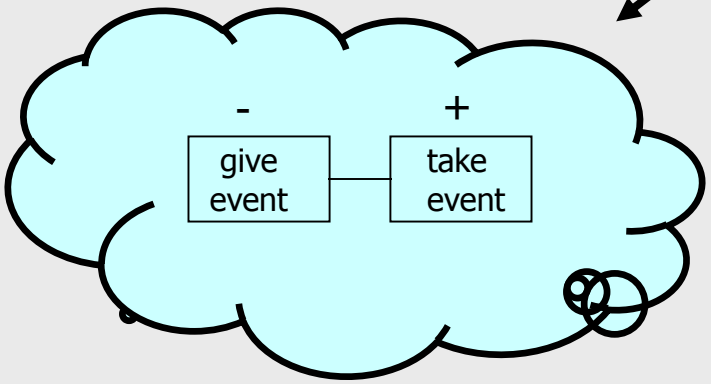
1. Green – "What has occurred" – REA, duality, stockflow {inflow, outflow}, participate {from, to} {inside, outside}
2. Yellow – What could be or should be – TYPES, typify, policy
3. Purple – What is planned or scheduled – COMMITMENTS, specify, fulfill, reciprocal, triggers



Coase

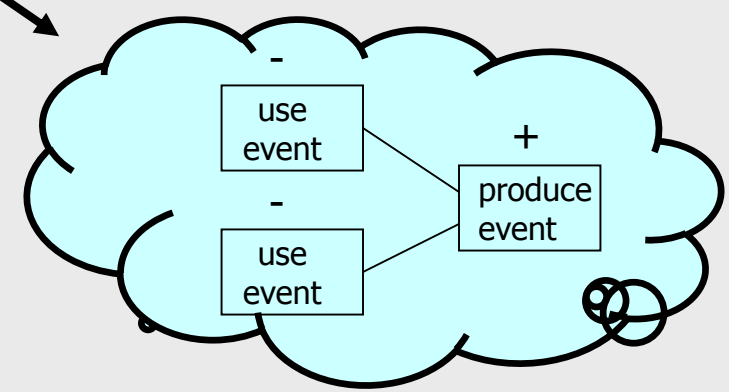


Exchange (buy) Processes

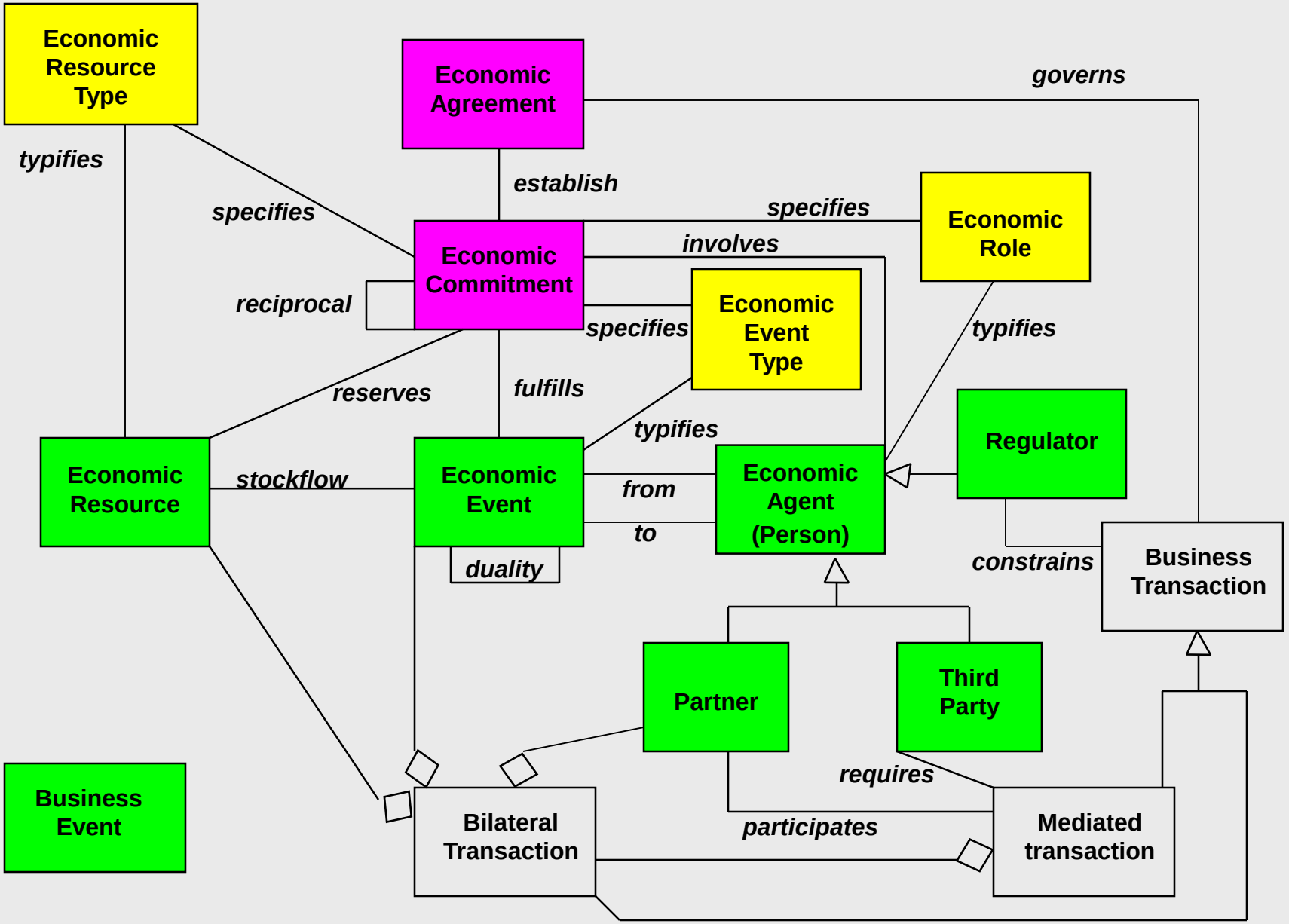


1. *Planning—Identification-Negotiation-Actualization-Post-actualization* phases
2. inside/outside participate
3. 1-to-1, 1-to-n, n-to1, m-to-n duality

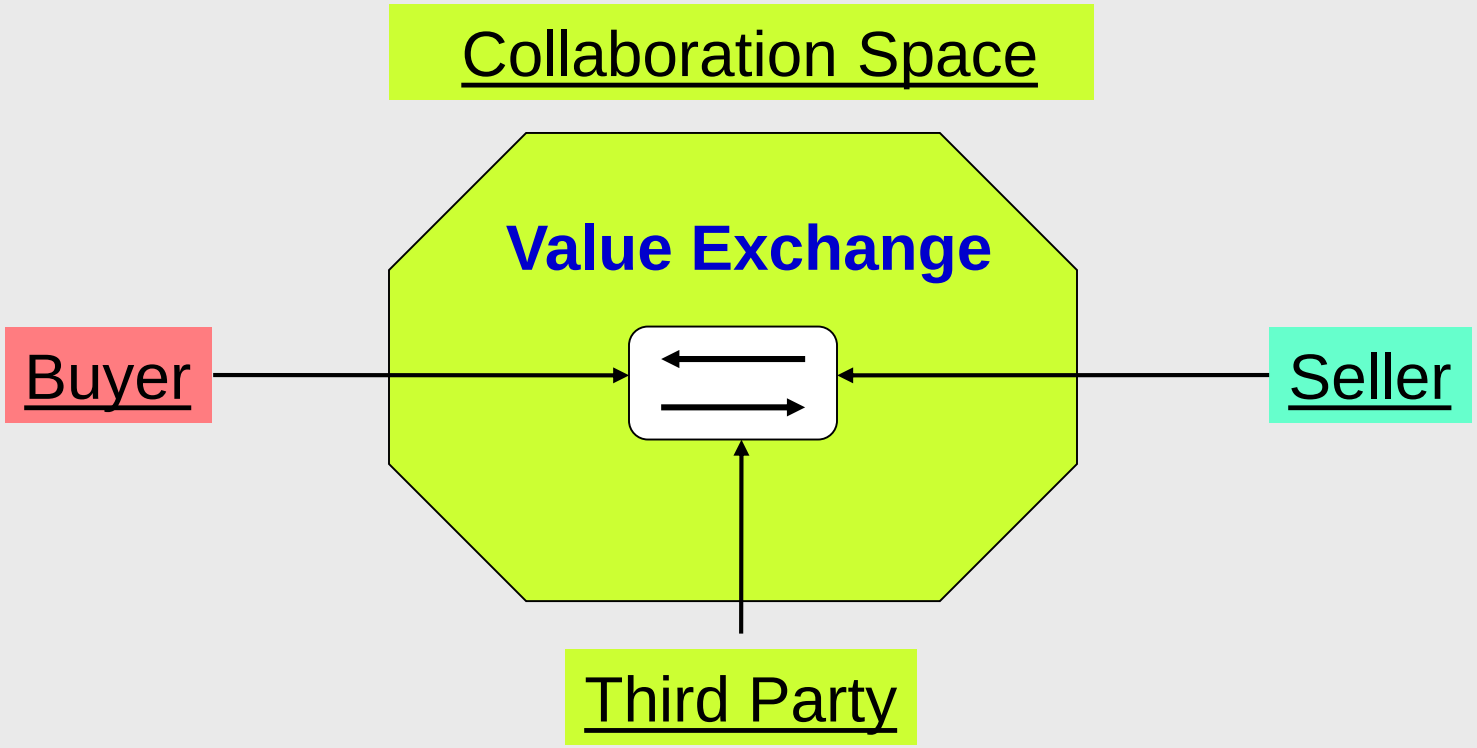
Conversion (make) Processes



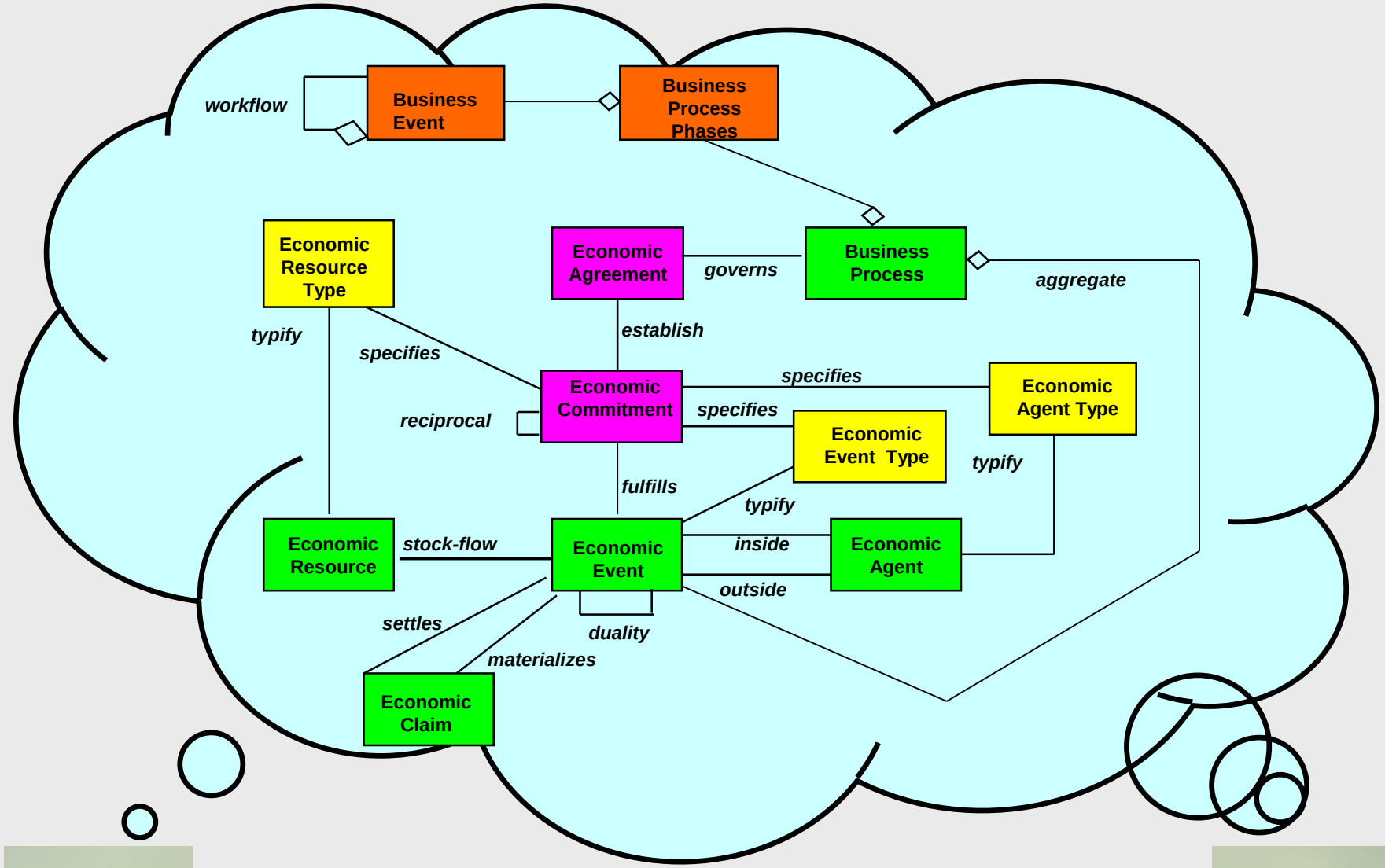
1. *Planning—Negotiation-Actualization-Post-actualization* phases
2. inside only participate
3. n-to-1 dualities (meronym)



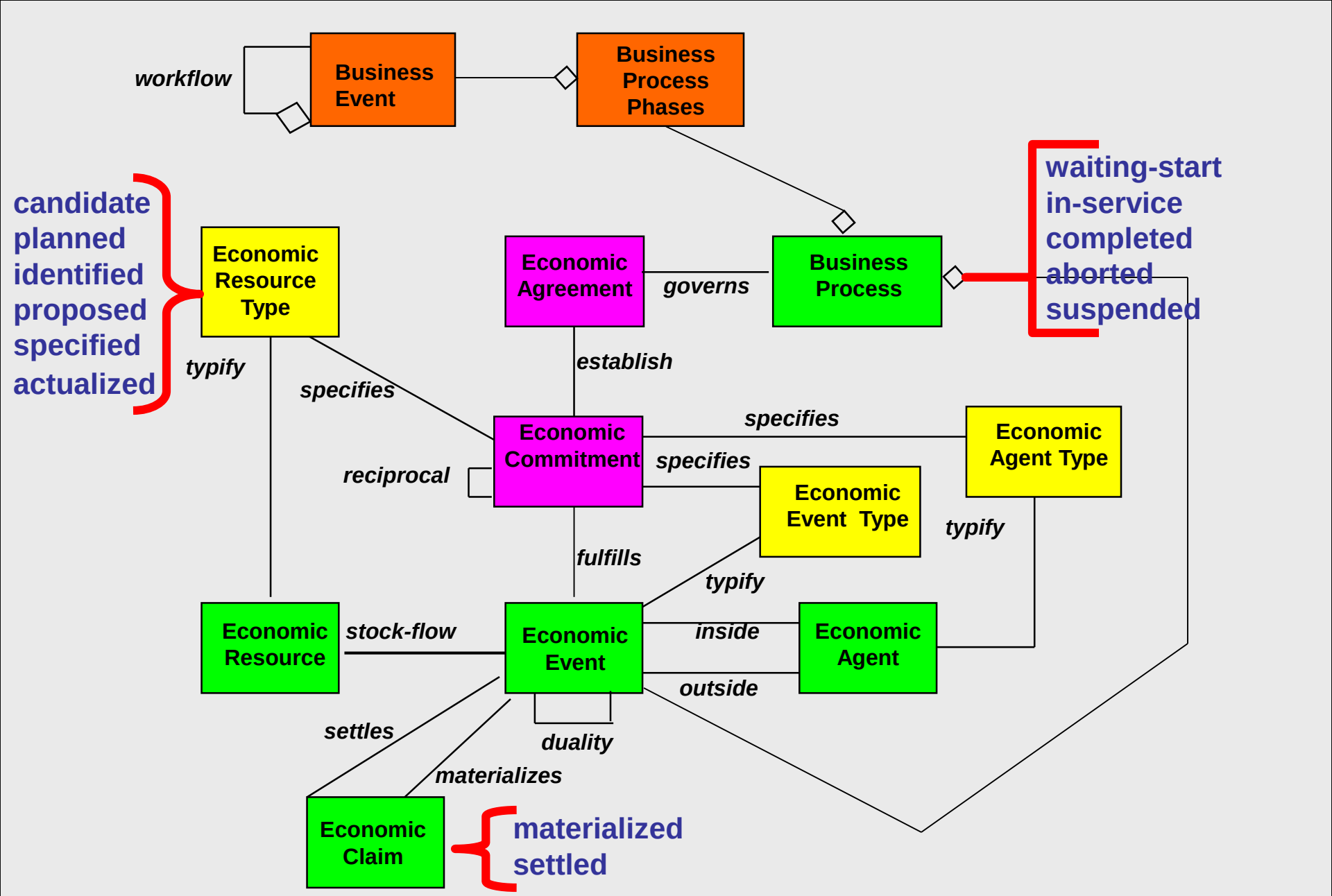
Class Model for ISO 15944-4 (Open-edi Ontology)



Source: ISO 15944-4

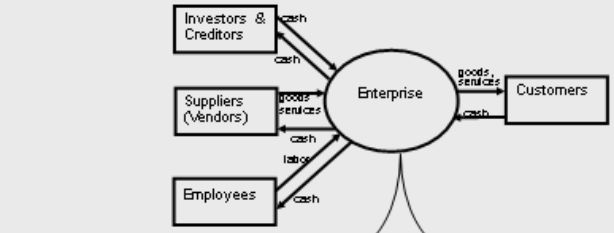


Buyer & Seller --> collaboration space



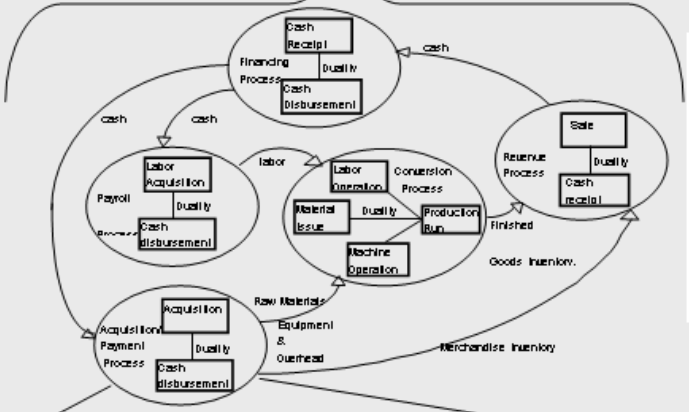
ISO 15944-4 -- Business Objects with States (ebXML source)

Granularity Hierarchy for REA Business Process Models (figure done by Cheryl Dunn)



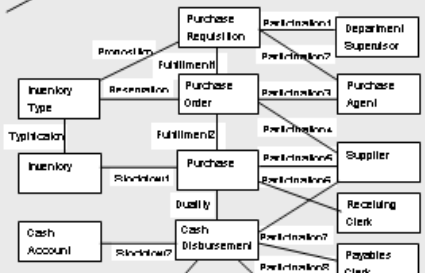
Value System Level

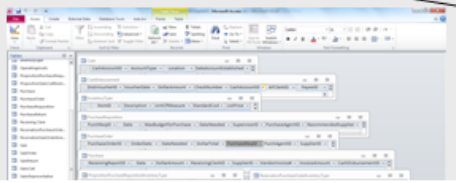
External connections between enterprise and its business partners as indicated by resource flows



Value Chain Level

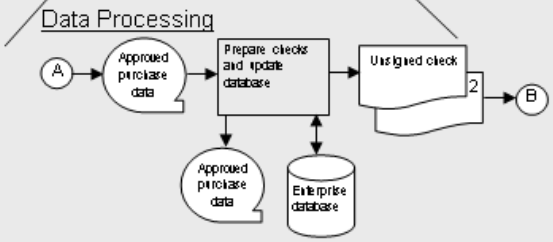
Internal resource flows within an enterprise, between its various business processes. Notice NO external business partners are included on this level. The value chain level describes what occurs inside the bubble labeled Enterprise at the value system level.





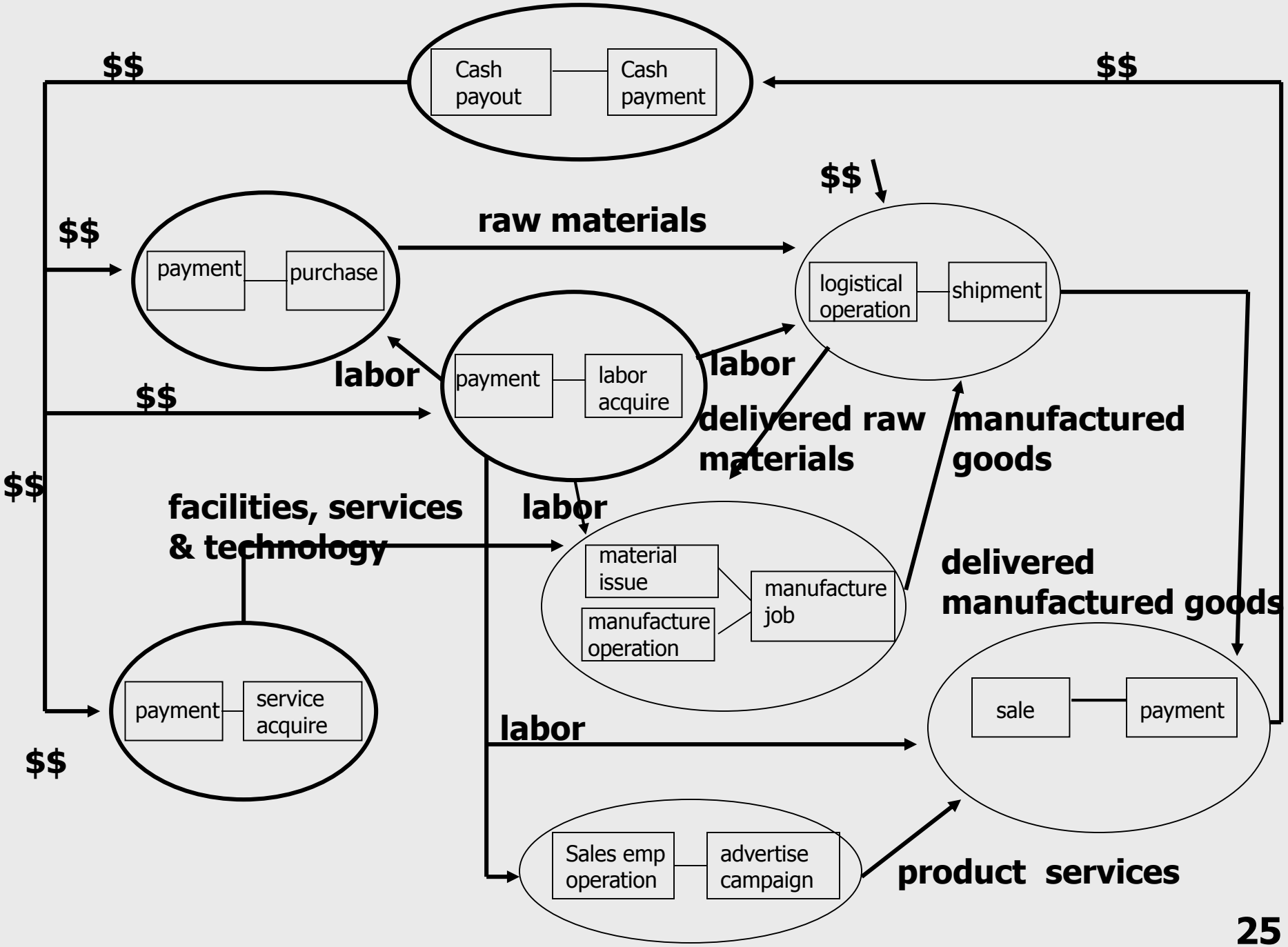
Business Process Level

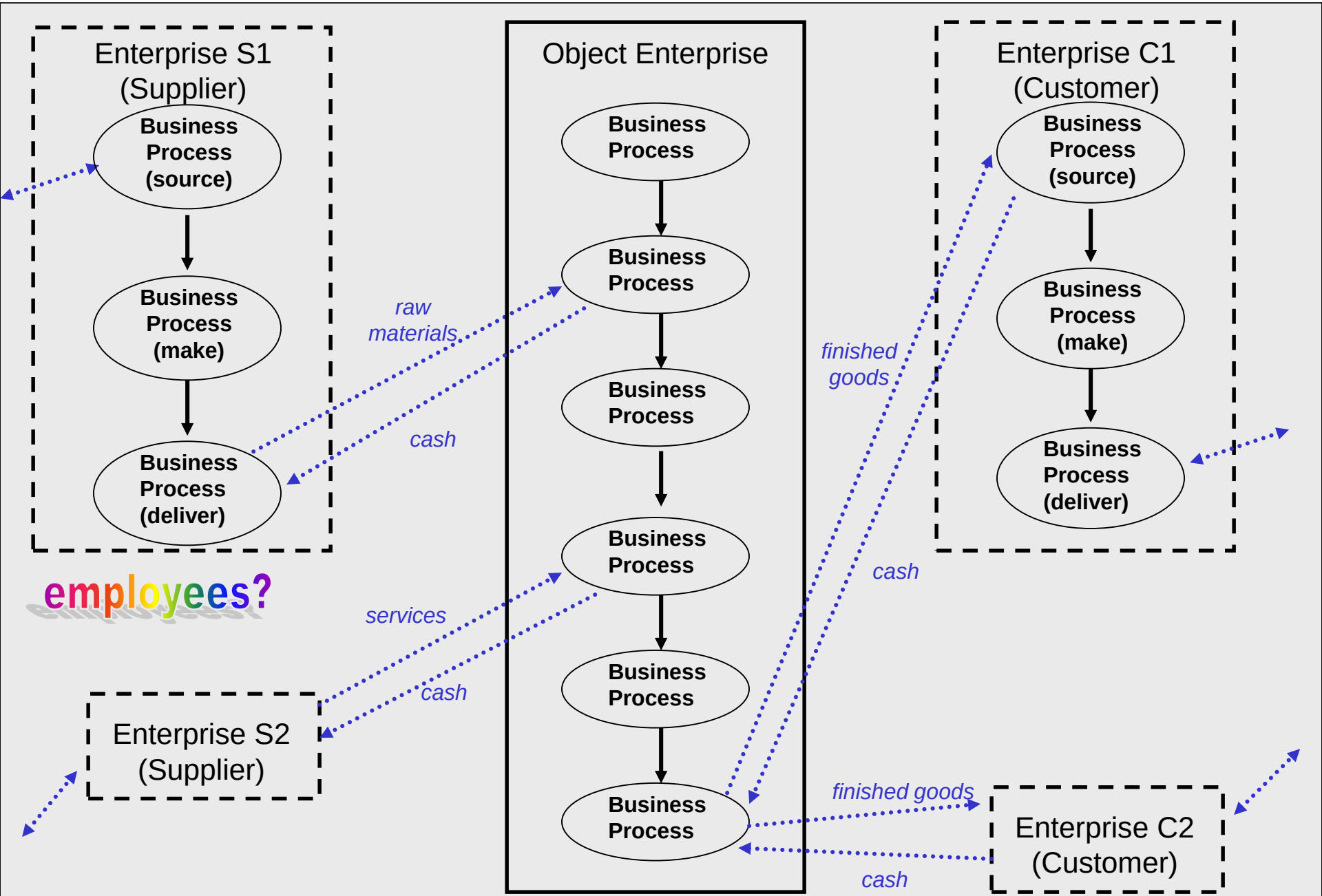
Each transaction cycle from the value system level is decomposed into the resources, economic events (both increment and decrement events), agents, as well as other entities. Relationships between entities include duality, stockflow, participation, and many others. Business process level models from each of the transaction cycles are integrated into one overall conceptual model for the company, merged on common entities and relationships. Once merged, the conceptual model is converted into relational database tables or some other type of physical



Task Level

Each event from the Business Process Level is decomposed into the workflow by which the event is accomplished, including the inputs, processes, and outputs as well as identifying areas of responsibility. Task Level models may be represented in many different formats including document flowcharts, process maps, data flow diagrams, and others. The flowchart shown at left is only a small piece of a flowchart to represent purchase and payment


Cash payout
Cash payment
$$
$$
$$
$$
raw materials
payment
purchase
logistical operation
shipment
labor
payment
labor acquire
labor
$$
delivered raw materials
manufactured goods
$$
facilities, services & technology
labor
material issue
manufacture job
manufacture operation
delivered manufactured goods
payment
service acquire
$$
labor
sale
payment
Sales emp operation
advertise campaign
product services

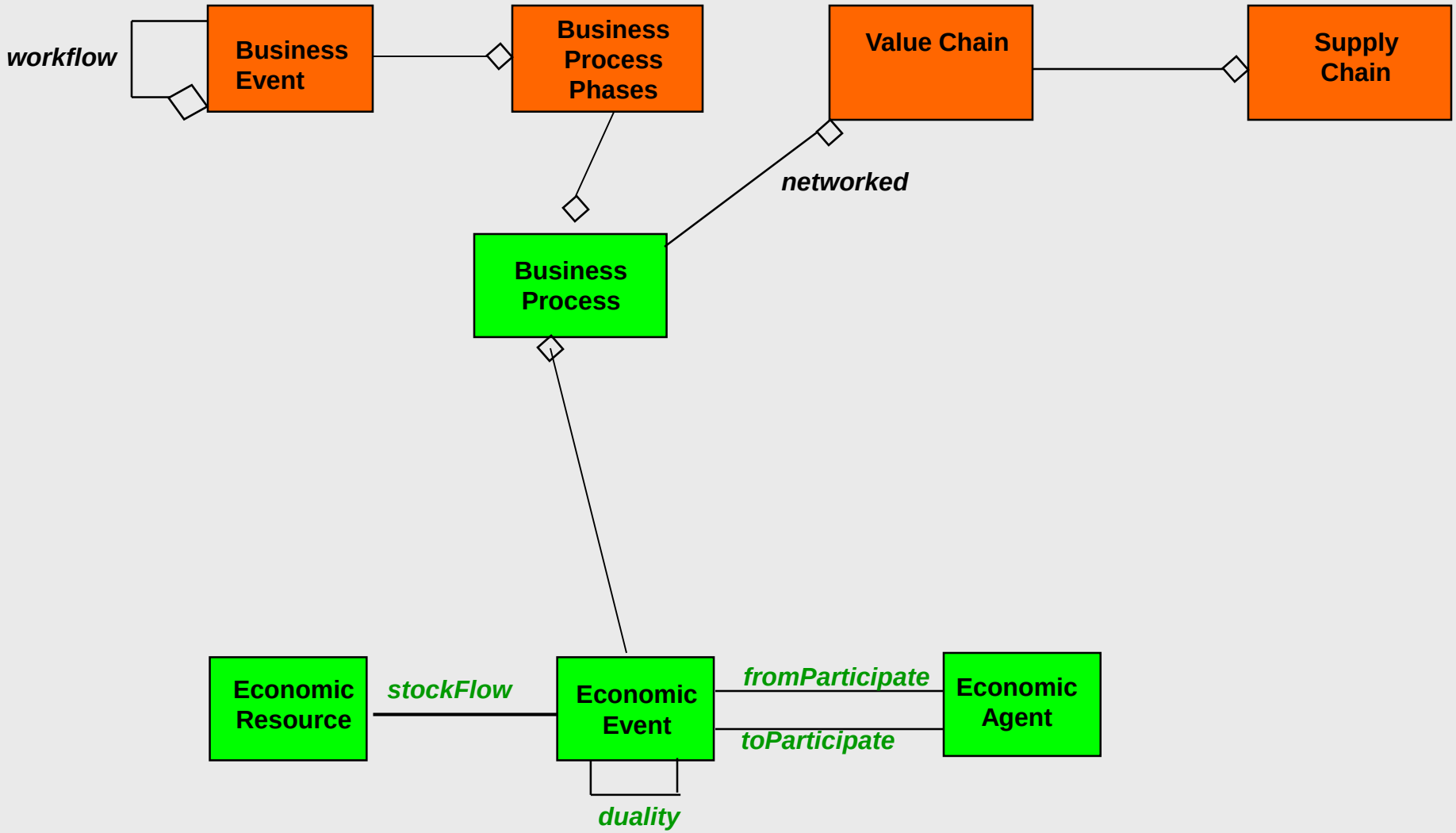


REA Modeling at the Value System (Supply Chain) level -- Trading Partner View

- Planning: In the Planning Phase, both the buyer and seller are engaged in activities to decide what action to take for acquiring or selling a good, service, and/or right.
- Identification: The Identification Phase pertains to all those actions or events whereby data is interchanged among potential buyers and sellers in order to establish a one-to-one linkage.
- Negotiation: The Negotiation Phase pertains to all those actions and events involving the exchange of information following the Identification Phase where a potential buyer and seller have (1) identified the nature of good(s) and/or service(s) to be provided; and, (2) identified each other at a level of certainty. The process of negotiation is directed at achieving an explicit, mutually understood, and agreed upon goal of a business collaboration and associated terms and conditions. This may include such things as the detailed specification of the good, service, and/or right, quantity, pricing, after sales servicing, delivery requirements, financing, use of agents and/or third parties, etc.
- Actualization: The Actualization Phase pertains to all activities or events necessary for the execution of the results of the negotiation for an actual business transaction. Normally the seller produces or assembles the goods, starts providing the services, prepares and completes the delivery of good, service, and/or right, etc., to the buyer as agreed according to the terms and conditions agreed upon at the termination of the Negotiation Phase. Likewise, the buyer begins the transfer of acceptable equivalent value, usually in money, to the seller providing the good, service, and/or right.
- Post-Actualization: The Post-Actualization Phase includes all of the activities or events and associated exchanges of information that occur between the buyer and the seller after the agreed upon good, service, and/or right is deemed to have been delivered. These can be activities pertaining to warranty coverage, service after sales, post-sales financing such as monthly payments or other financial arrangements, consumer complaint handling and redress or some general post-actualization relationships between buyer and seller.

SOURCE: ISO FDIS 15944-1 – *Operational Aspects of Open-edi for implementation*

Figure 21 -- ISO Open-edi Phases of a Business Transaction



REA Class Model of Different Granularity Levels

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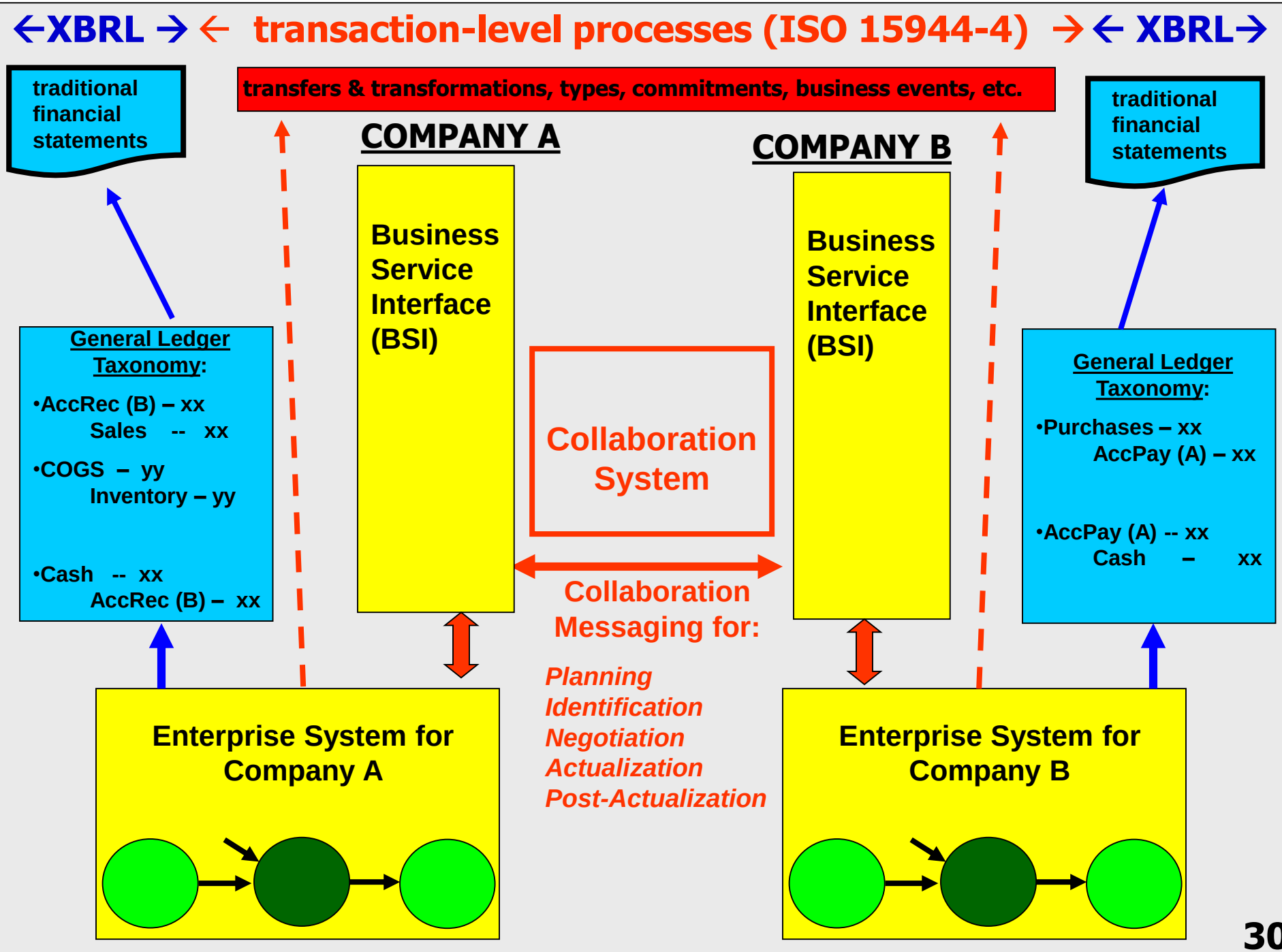
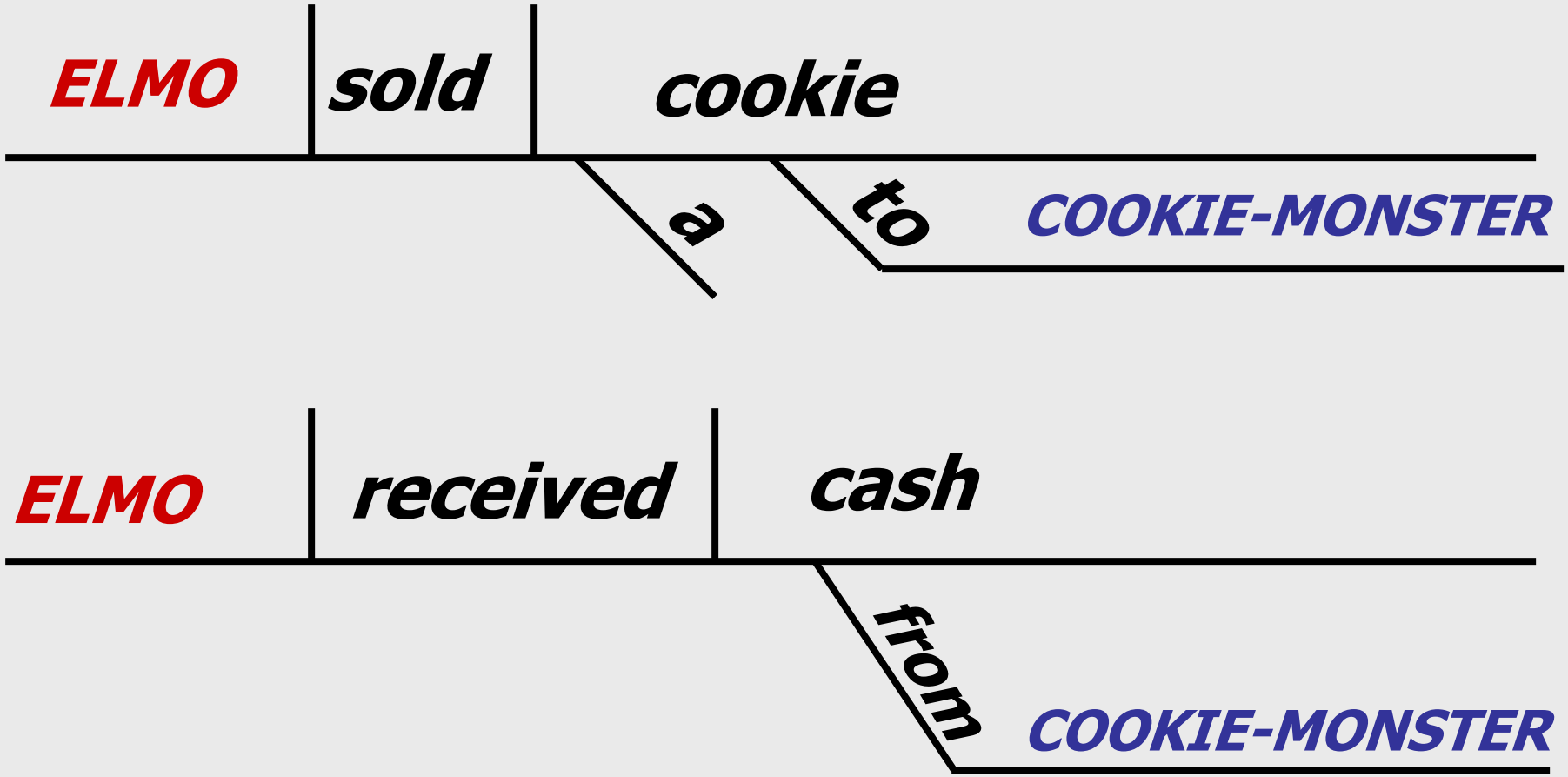

←XBRL→← transaction-level processes (ISO 15944-4) →← XBRL→
traditional financial statements
transfers & transformations, types, commitments, business events, etc.
traditional financial statements
COMPANY A
COMPANY B
Business Service Interface (BSI)
Business Service Interface (BSI)
General Ledger Taxonomy:
•AccRec (B) – xx
Sales -- xx
•COGS – yy
Inventory – yy
•Cash -- xx
AccRec (B) – xx
Collaboration System
Collaboration Messaging for:
Planning
Identification
Negotiation
Actualization
Post-Actualization
General Ledger Taxonomy:
•Purchases – xx
AccPay (A) – xx
•AccPay (A) -- xx
Cash – xx
Enterprise System for Company A
Enterprise System for Company B

Trading Partner View



Independent View