



Model-Driven Business Process Platforms

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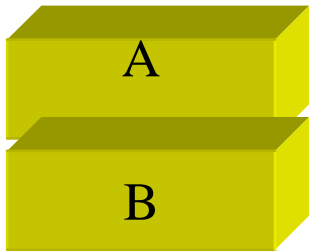
Last-generation value proposition

- Applications embody well-validated, accepted business processes

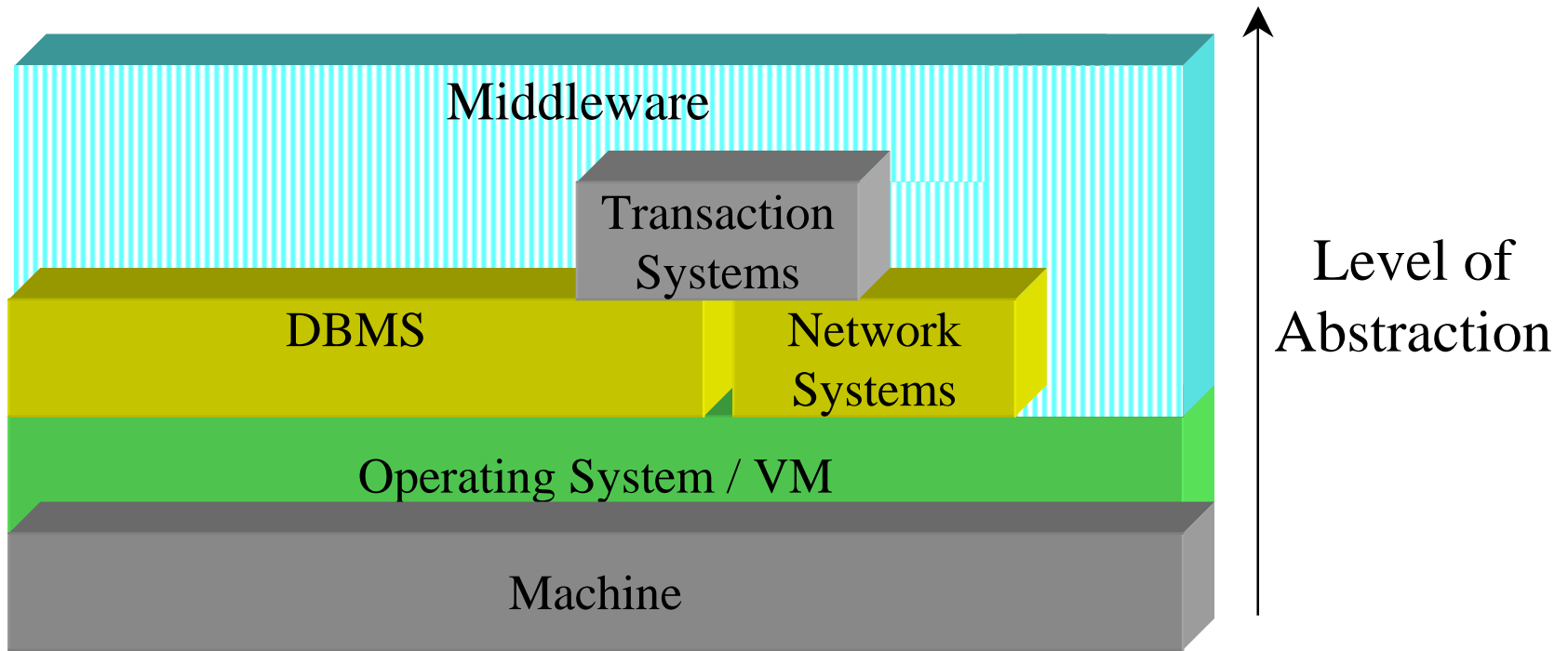
Next-generation business reality

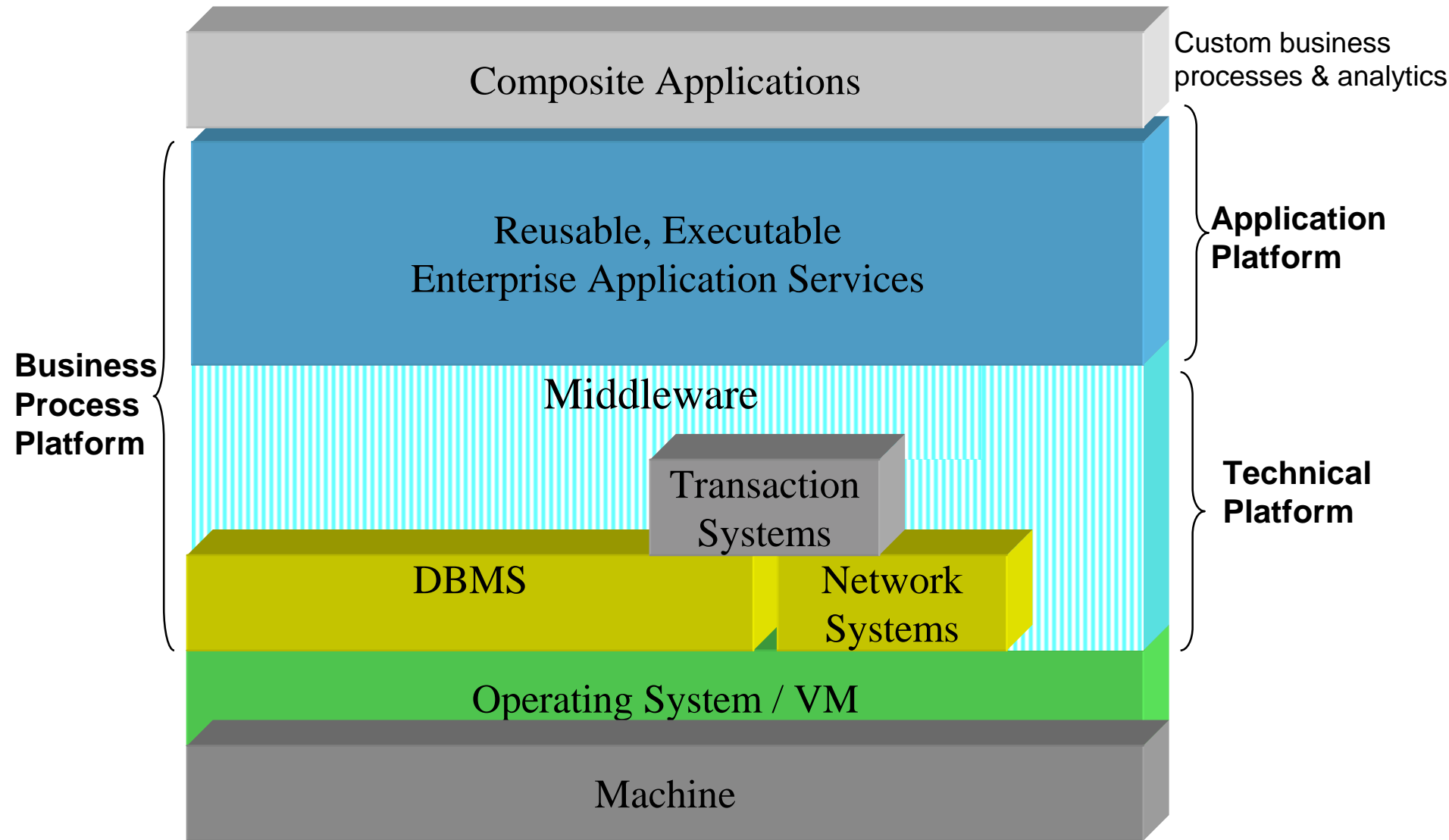
- Innovative business model and associated processes define an enterprise's competitive advantage
 - ◆ Not enough to have a great product
 - ◆ Must also have a great business model
- Not attractive to simply follow a business process defined elsewhere
- Outsourcing all but core business processes
- Need flexibility in designing and executing innovative business processes
 - ◆ Core business processes
 - ◆ Value Chains / Value Networks for accessing mission-critical, non-core processes

The Technical Platform Stack



Means A depends on B





MS Office is a *desktop application platform*

- Has hundreds of components (has had them for 15 years)
 - ◆ Stateless: e.g. a thesaurus component
 - ◆ Stateful: CRUD operations on office documents and calendars
- Powerful tools for rapid assembly of innovative desktop applications
 - ◆ Visual basic
 - ◆ Code wizards

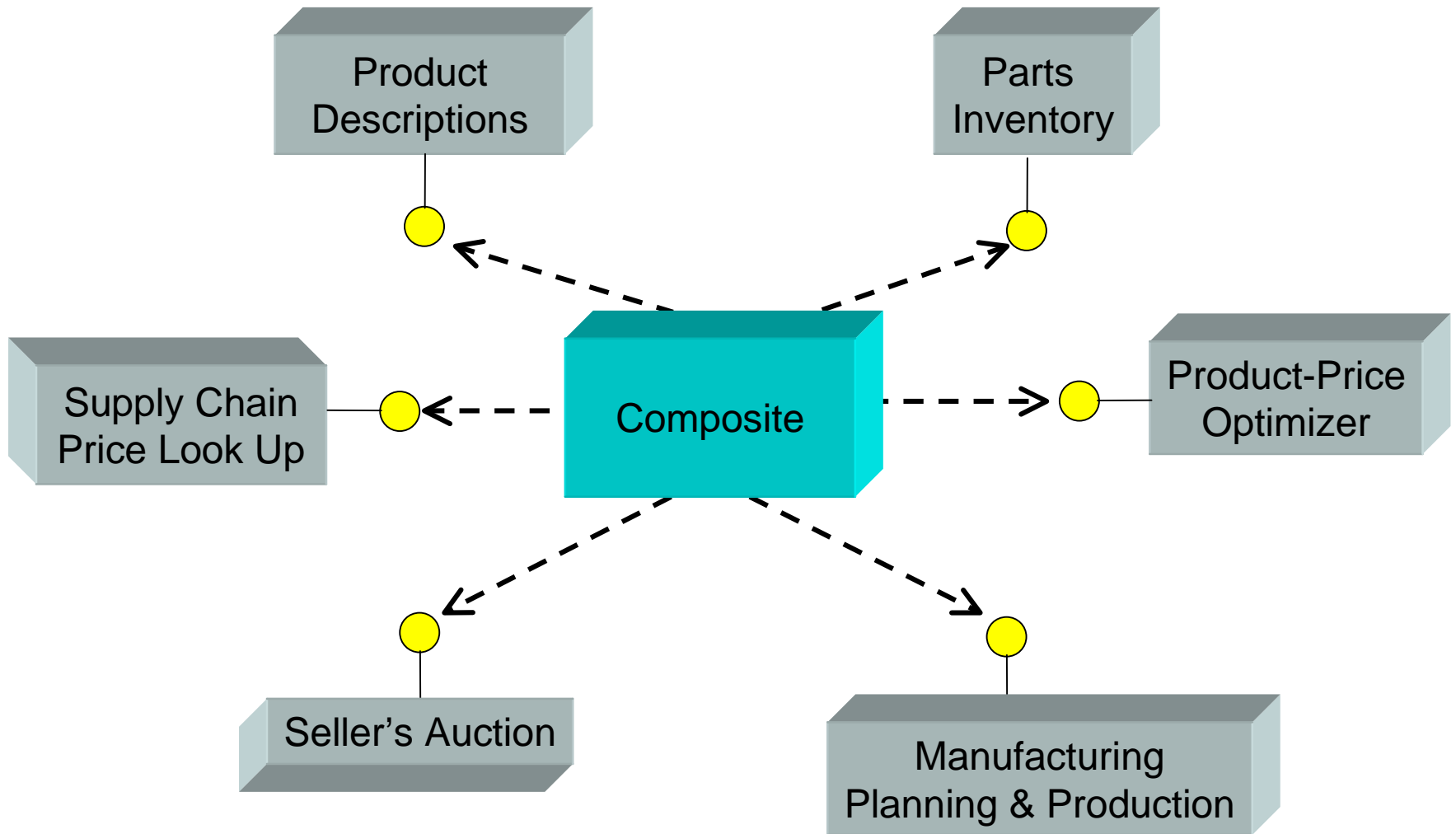
A BPP has an *enterprise application platform*

- Will have hundreds (or more) components
 - ◆ Stateless, e.g. calculations
 - ◆ Stateful: CRUD operations on systems of record
- Model-driven tools
 - ◆ Composite application construction tools
 - ◆ Business Process Management tools

Synergy

- Integrating desktop and enterprise application platforms
 - ◆ Opens up another order of magnitude of possibilities for innovative composite applications

Composite App: Procure-to-Pay, Order-to-Cash, Manufacture-to-Inventory

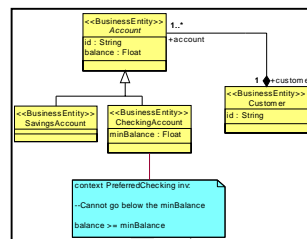


David Burdett, SAP Labs

--> = Invoke

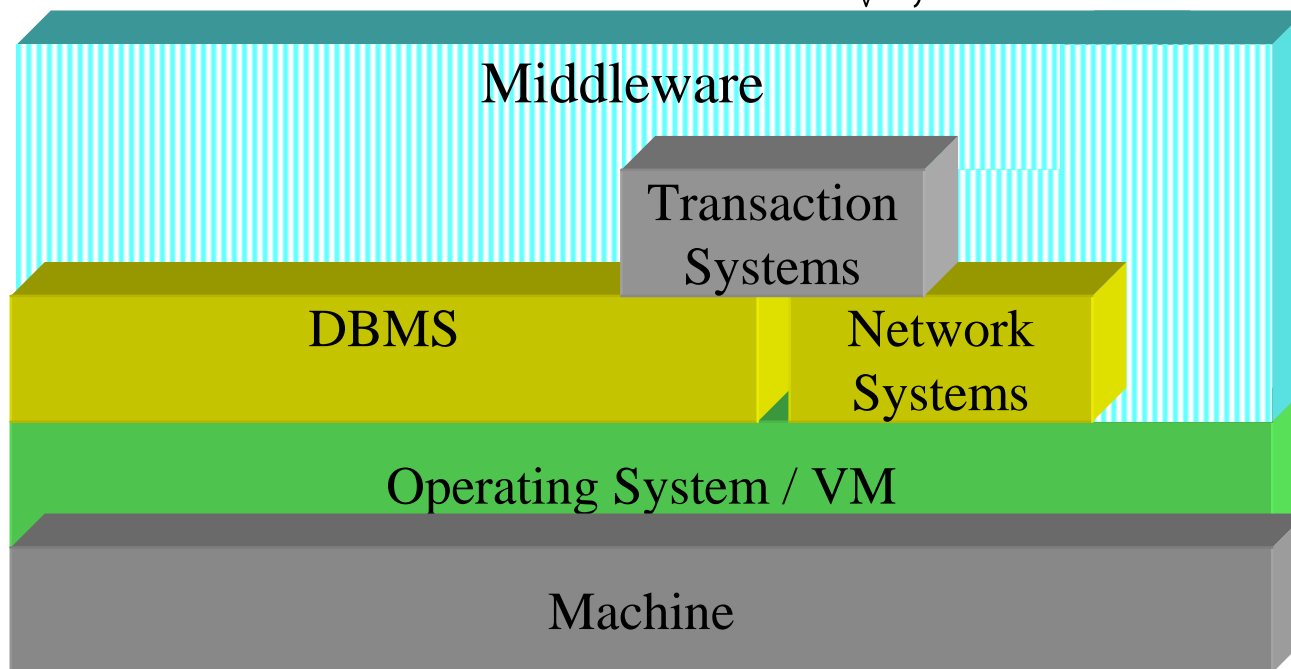
Model Compilers and the Abstraction Level

Application Model



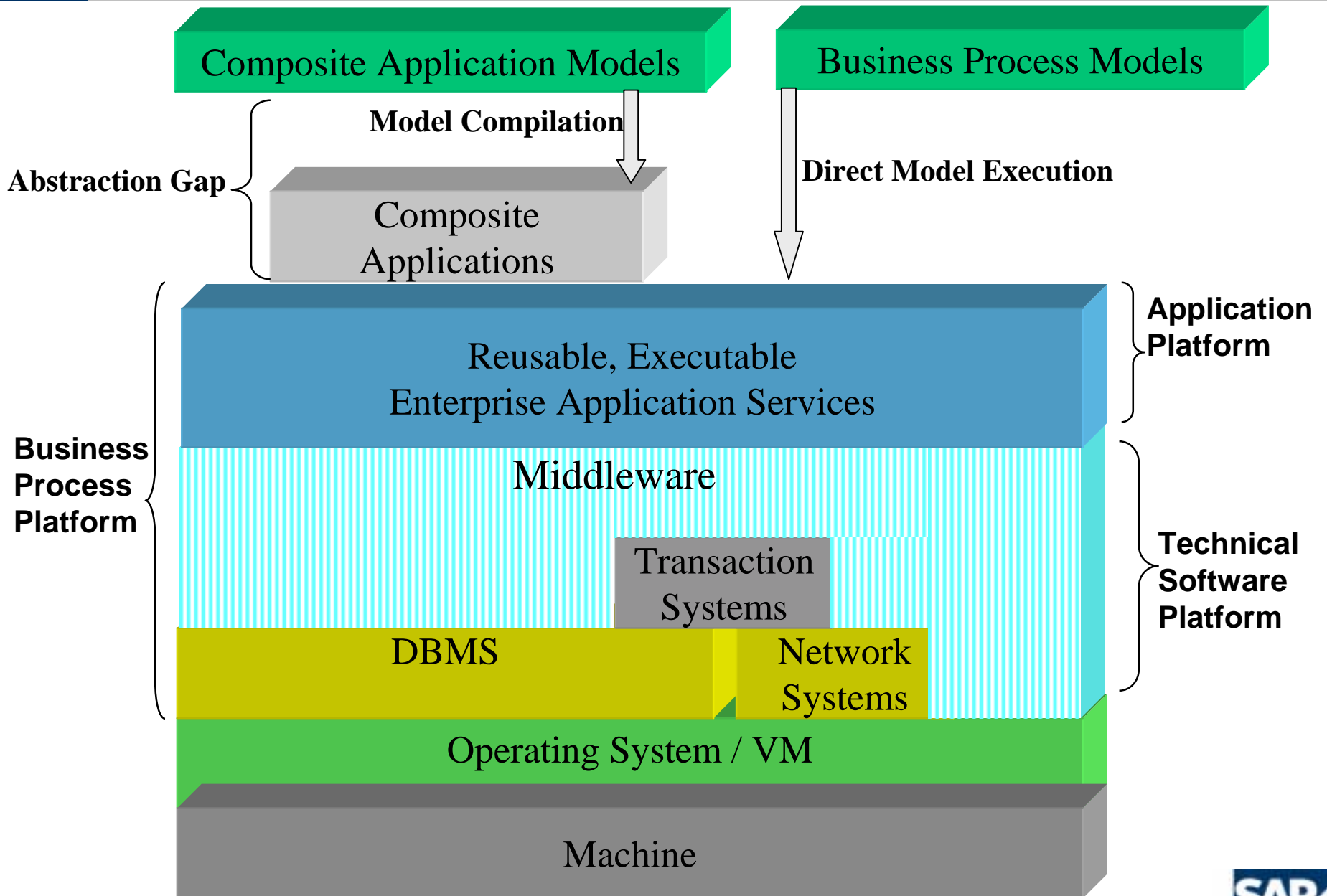
Model Compilation

Abstraction Gap



Level of Abstraction

Model-Driven Tools Empowering the Business Process Expert (BPX)



This jump in the platform abstraction level is more difficult than the last jump (middleware)

- **Just as raising the abstraction level for development languages above 3GLs is more difficult than the last jump to 3GLs**

Crawl, Walk, Run

- **Provide business value at every step**

Semantically thin specifications reach their limits

- **How do you achieve semantic interoperability on top of syntactic interoperability?**
 - ◆ Do collaborating parties have a common understanding the contract of a service?
 - ◆ You can't rely on informal conversations among people
 - ◆ The parties might have different human languages as native tongues
- **How do you find suitable services to compose?**
 - ◆ Suitable functional behavior
 - ◆ Suitable quality of service?
- **Same for reusable business processes**

Configuration/version/dependency management problems do not go away

- **They can even get worse**

Need a metadata-rich environment to *assist* humans using the business process platform

■ Specifying Constraints

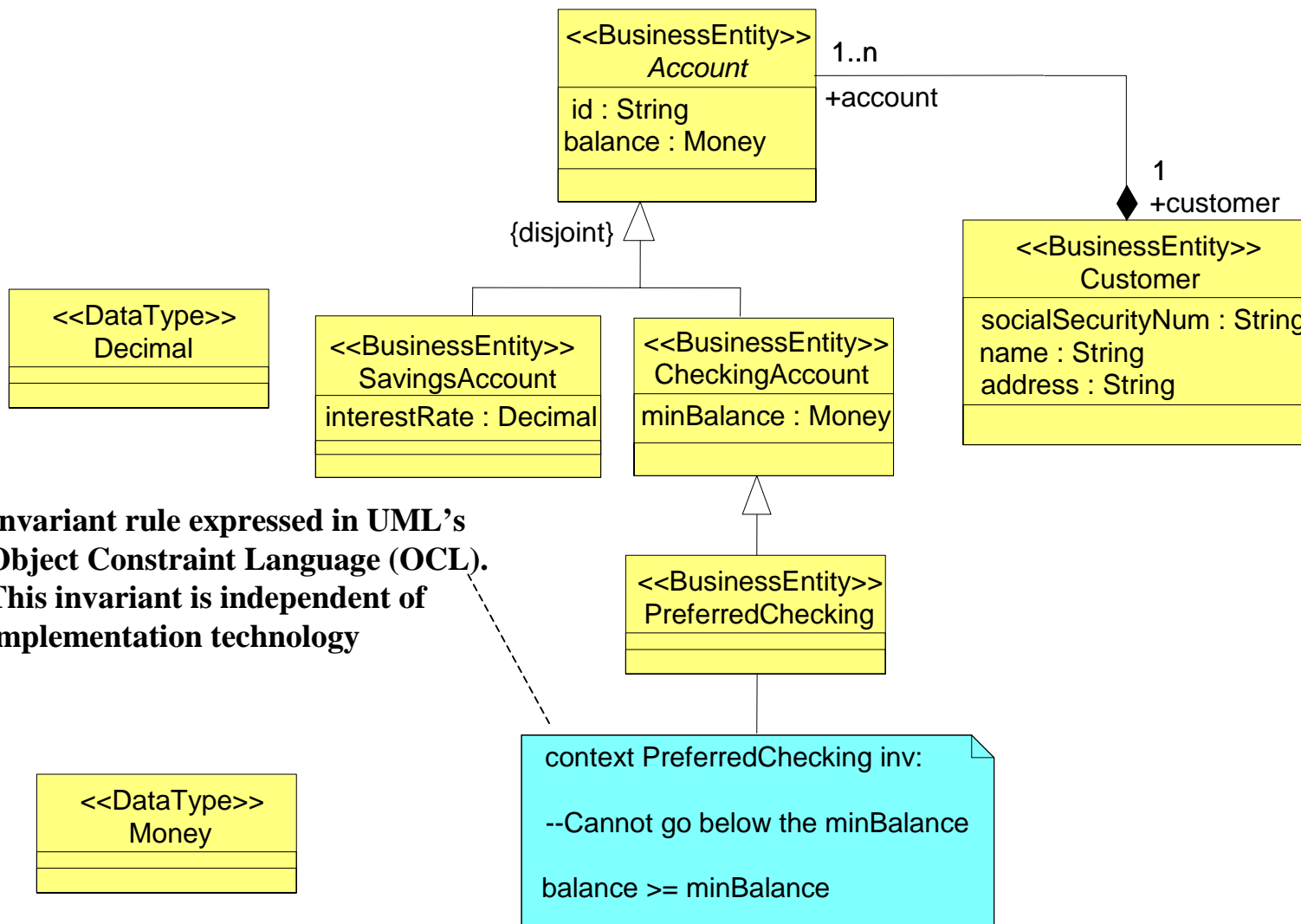
- ◆ Service message/data types specified as precisely as possible
 - Invariants
- ◆ Service operations functional contract specified as precisely as possible
 - Preconditions and postconditions (more numerous than invariants)
- ◆ Using machine-readable, declarative constraint languages
- ◆ We've know how to do this for decades
- ◆ Also improves quality
- ◆ Also need to learn to specify QoS requirements and capabilities as precisely as possible

■ Inferences identify candidates or flag potential problem combinations

- ◆ Let the human decide what to do
- ◆ Record what the human decides
- ◆ Show the next human what the others decided
- ◆ Learn

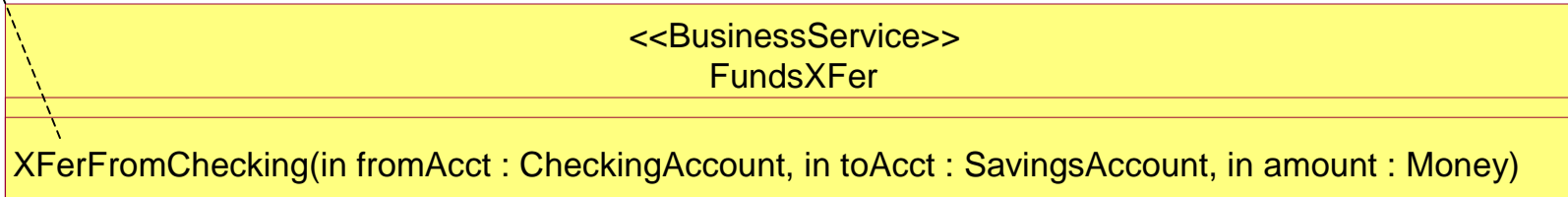
Abstract Business Information Model: IT Viewpoint

With an Invariant Rule



Formal Abstract Model of a Business Service With Pre-conditions and Post-Conditions

Signature



```
context FundsXfer::XferFromChecking (fromAcct : CheckingAccount, toAcct : SavingsAccount amount : Money) : void
pre:
  --There must be sufficient funds in the checking account to support the transfer
  fromAcct.balance >= amount
pre:
  --The checking account and the savings account must belong to the same customer
  fromAccount.customer = toAcct.customer
post:
  --The balance of the checking account is reduced from its original amount by the amount of the transfer
  fromAcct.balance = fromAcct.balance@pre - amount
post:
  --The balance of the savings account is increased from its original amount by the amount of the transfer
  toAcct.balance = toAcct.balance@pre + amount
```

Pre/post conditions—Independent of implementation technology

Operative business rule

■ If the drop-off location of a rental is not the EU-Rent site of the return branch of the rental then it is obligatory that the rental incurs a location penalty charge.

Supporting fact types

- rental has drop-off location
- rental has return branch
- branch is located at EU-Rent site
- rental incurs location penalty charge

Adapted from Semantics of Business Vocabulary and Business Rules, OMG document dtc/06-03-02

Constraints having to do with a component's design-time or deployment-time configuration parameters

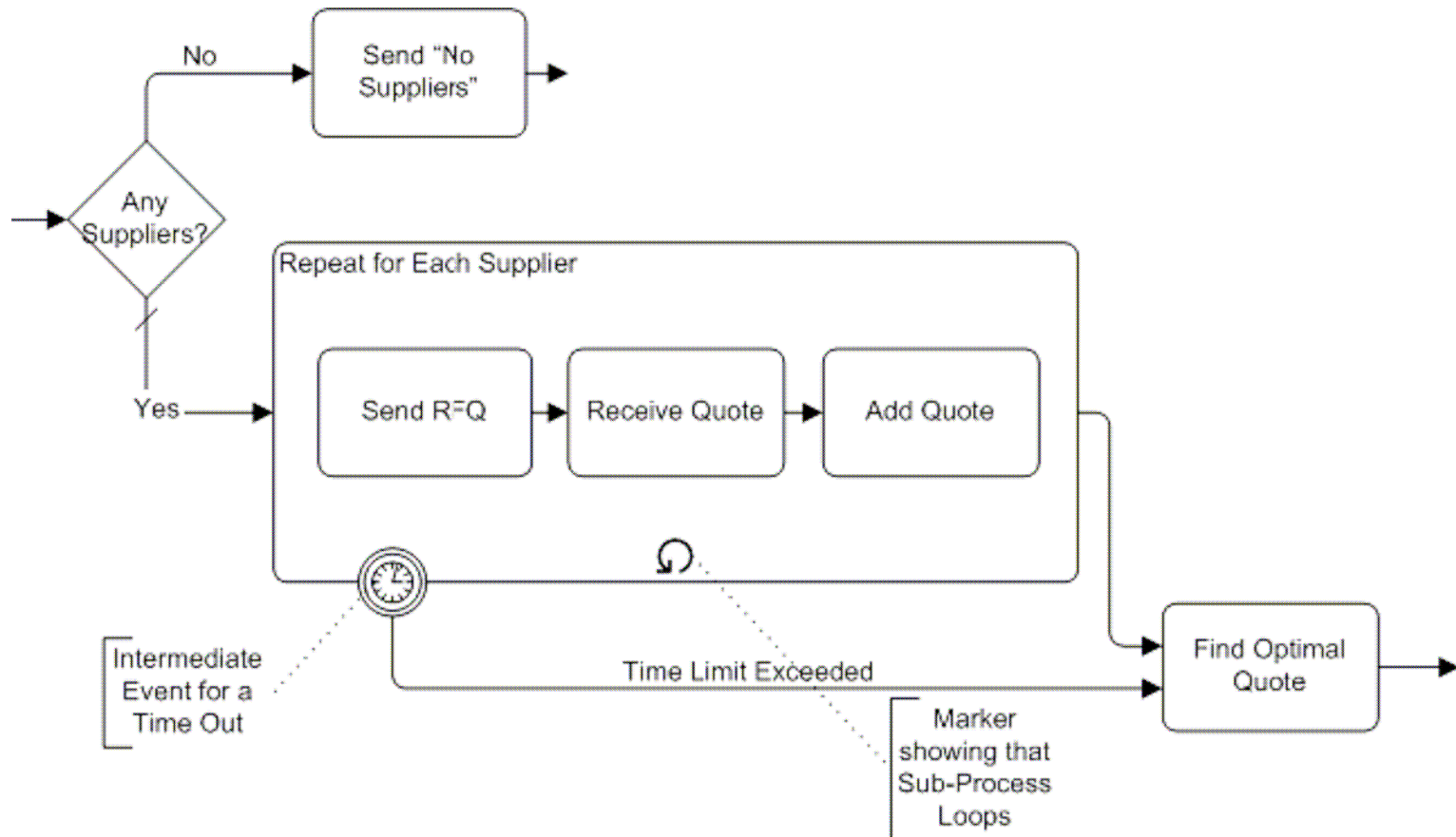
- The value of one configuration parameter may constrain the values of others
- Tools can enforce these kinds of constraints, with some limitations
- Tools can also detect collisions among configuration constraints that would result from specific combinations of components
 - ◆ Sometimes detection is certain and sometimes only suspected

Categories of tool support¹

- **Constraint checking:** Checking whether a particular configuration satisfies the constraints
- **Constraint propagation:** Inferring the values of undecided configuration settings from the values of decided settings
- **Constraint satisfiability:** Checking whether a set of constraints has at least one solution

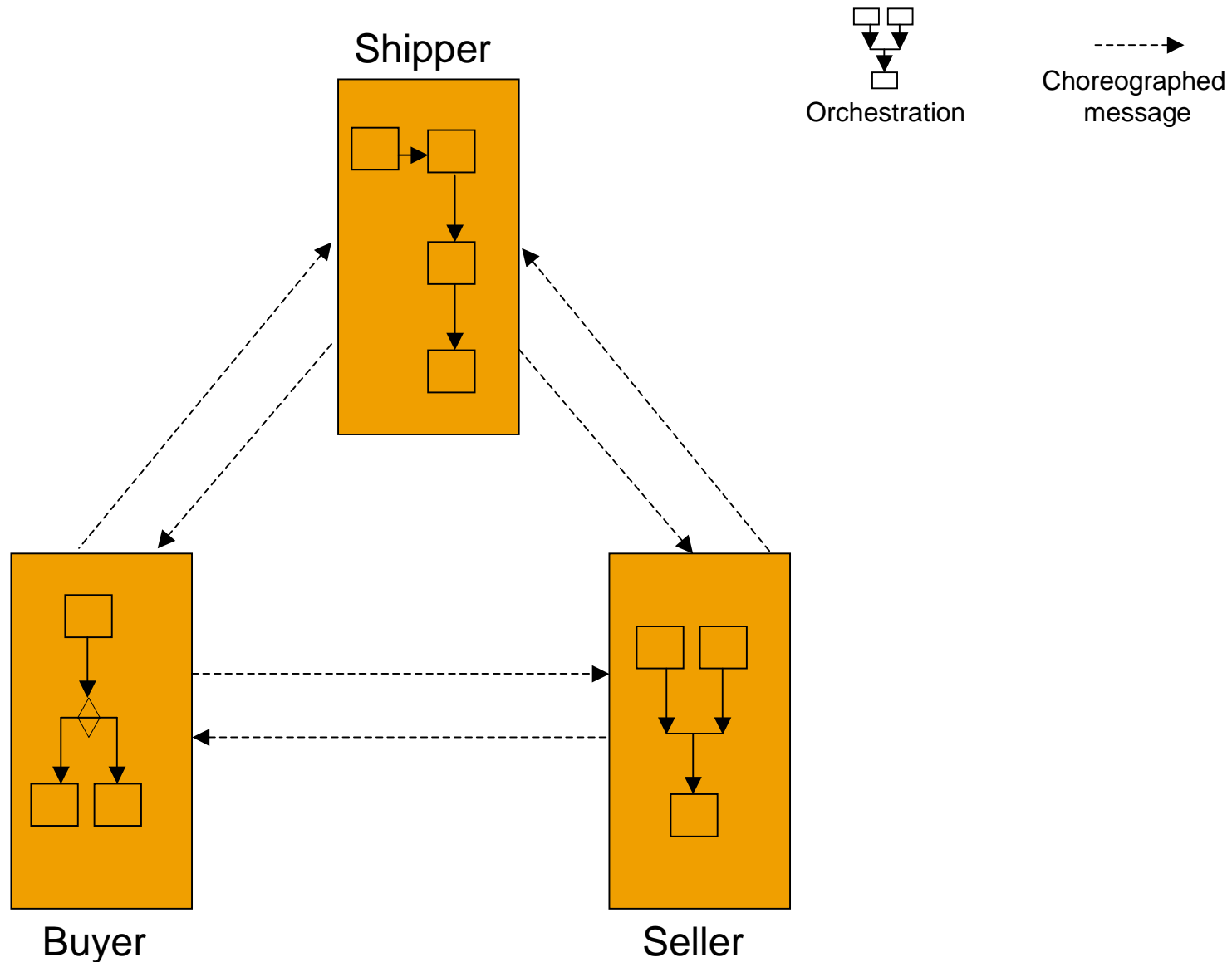
¹Krzysztof Czarnecki and Chang Hwan Peter Kim, "Cardinality-Based Feature Modeling and Constraints: A Progress Report," Proceedings of the First International Conference on Software Factories, OOPSLA 2005.

Business Process Modeling Notation (BPMN)



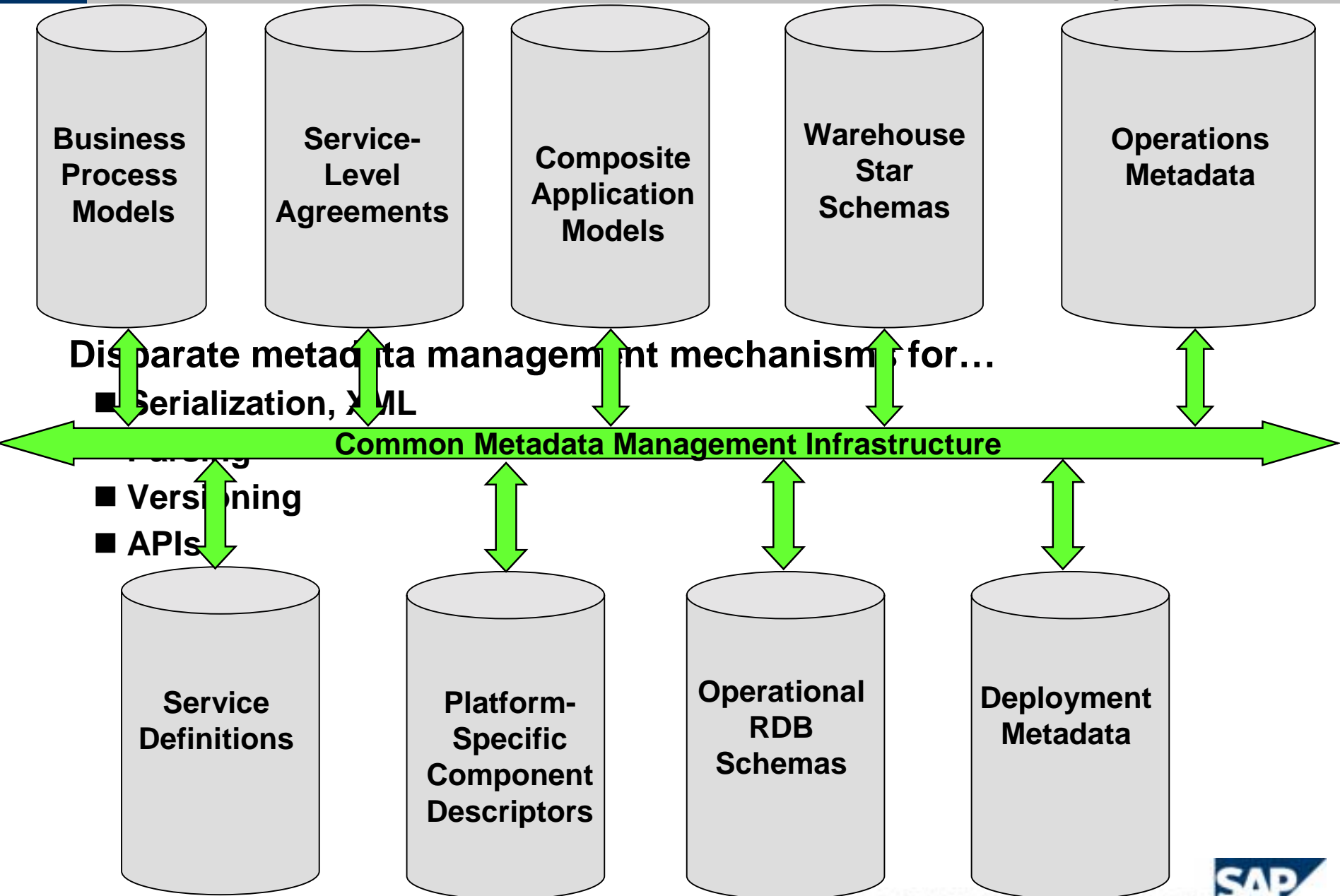
Example from "Introduction to BPMN" by Stephen White, IBM
Available at www.bpmi.org

Collaborative Business Processes

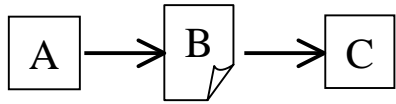


Metadata Across the Lifecycle

Model-Driven = Metadata-Driven (With Traceability)

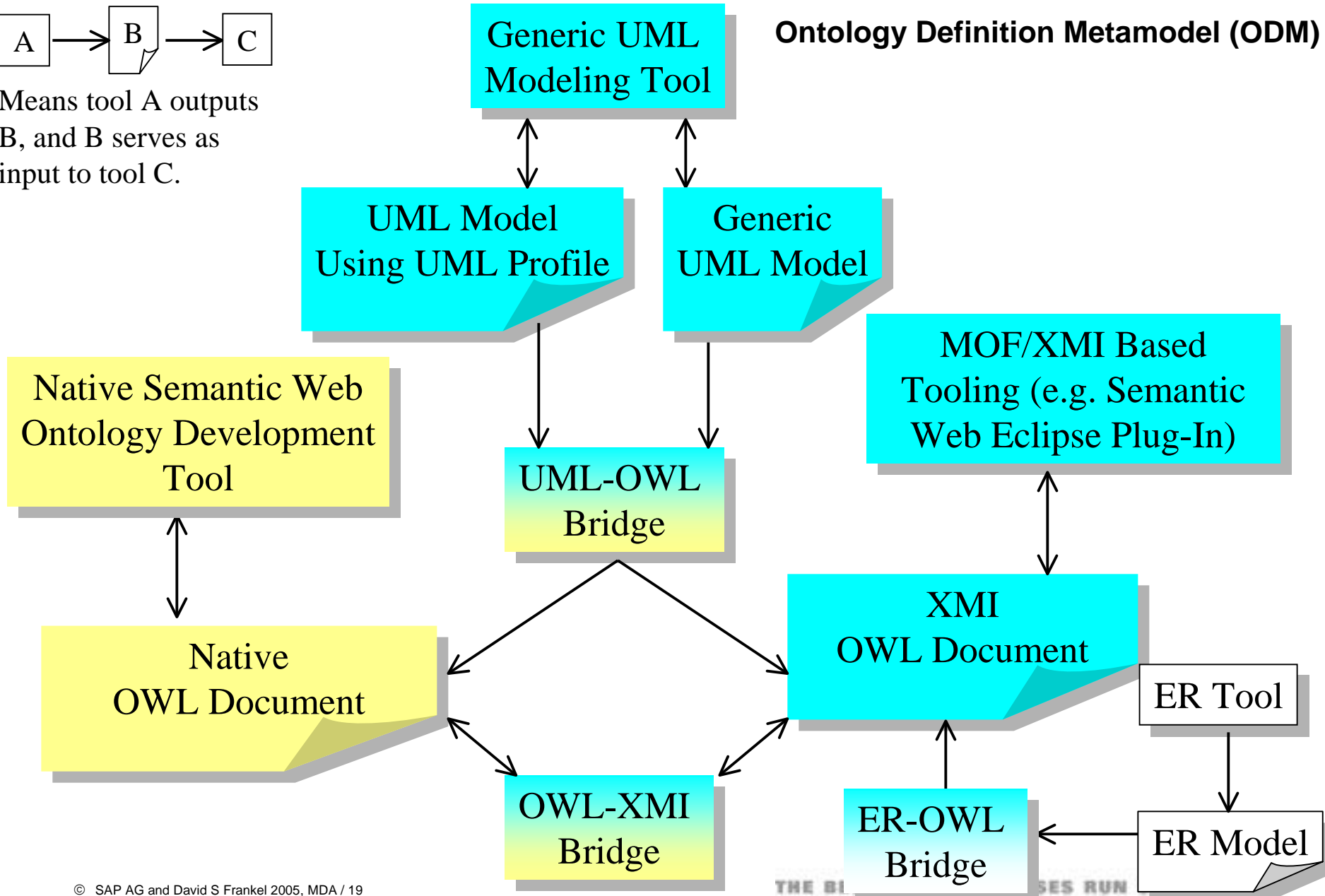


Seeking Formal Grounding for MDA To Improve Automated Assistance



Means tool A outputs B, and B serves as input to tool C.

Ontology Definition Metamodel (ODM)



How do you build reusable components?

- **Component-based development has proven hard in practice**
- **How do you anticipate requirements of composite applications?**

Individual Product 1

Individual Product 2

...

Individual Product n

Individual systems produced via *product development*

Production Plan

The Sims "Water Line"

Reusable assets for the product line
Created via *core asset development*

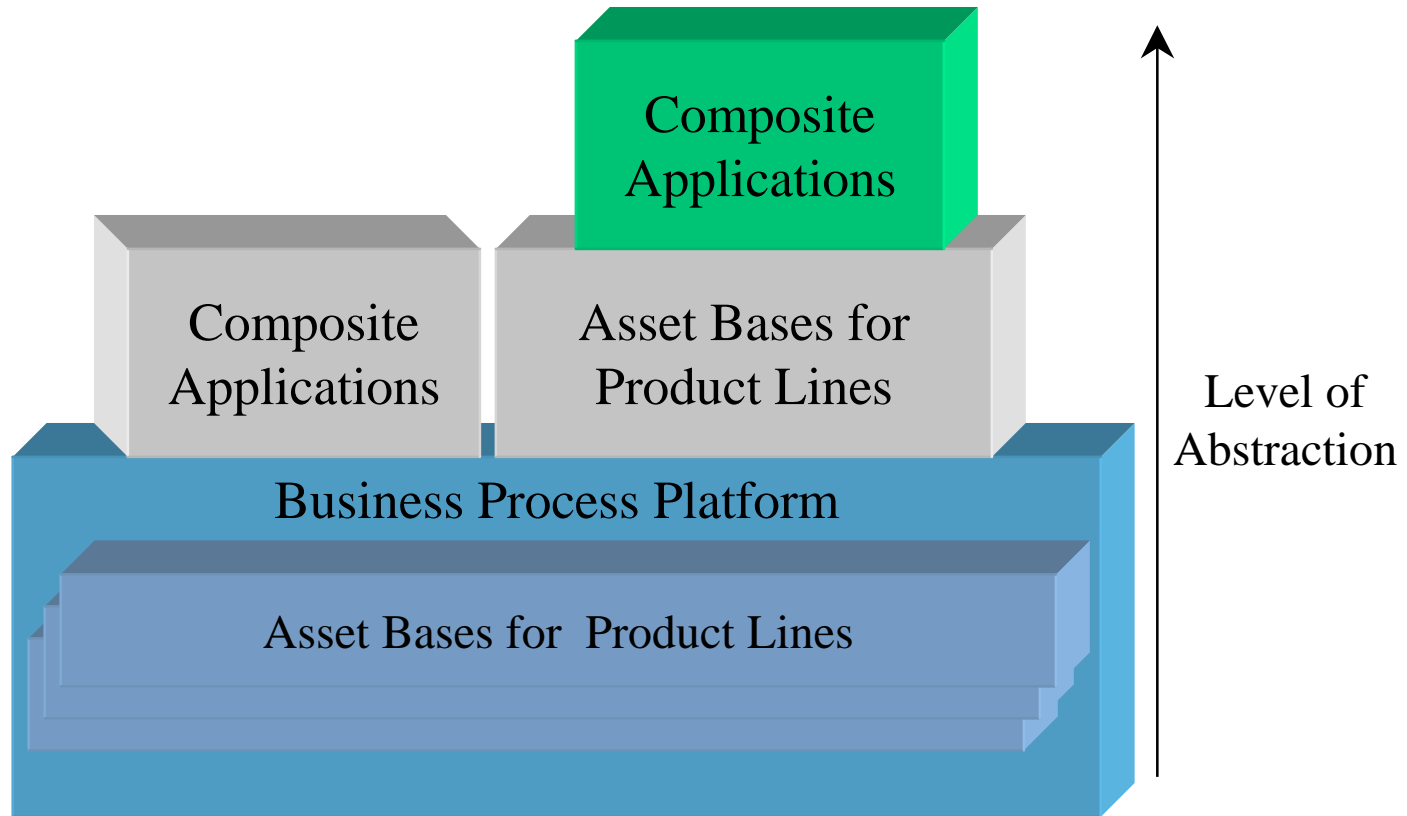
Architecture

Components

Specialized Compiler(s)

Domain-Specific Language(s)

Applying Product Line Practices



Business process platforms are coming

- **Transition will be gradual, but powerful**
- **Model-driven tools are important for making the platforms usable**

Configuration management has to be faced square-on

Metadata-rich environments, formal grounding, and product line practices needed to manage the complexity

Vigorous competition for a growing pie—if we do this right

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