Model-Driven Business Process Platforms

The Path to Enterprise SOA

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Economic Driver: The Innovation Economy

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

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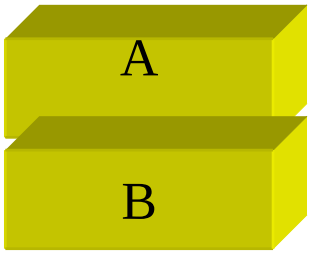
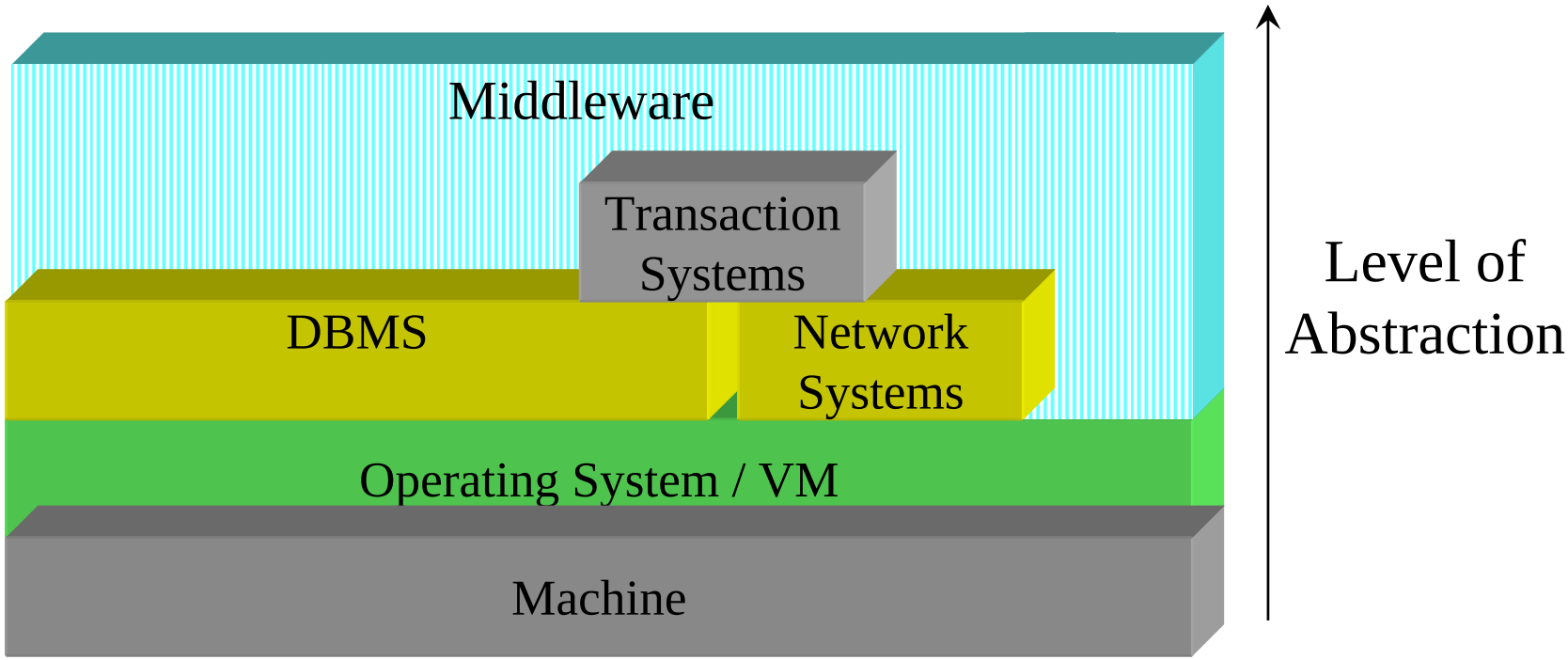
The Technical Platform Stack



Means A depends on B



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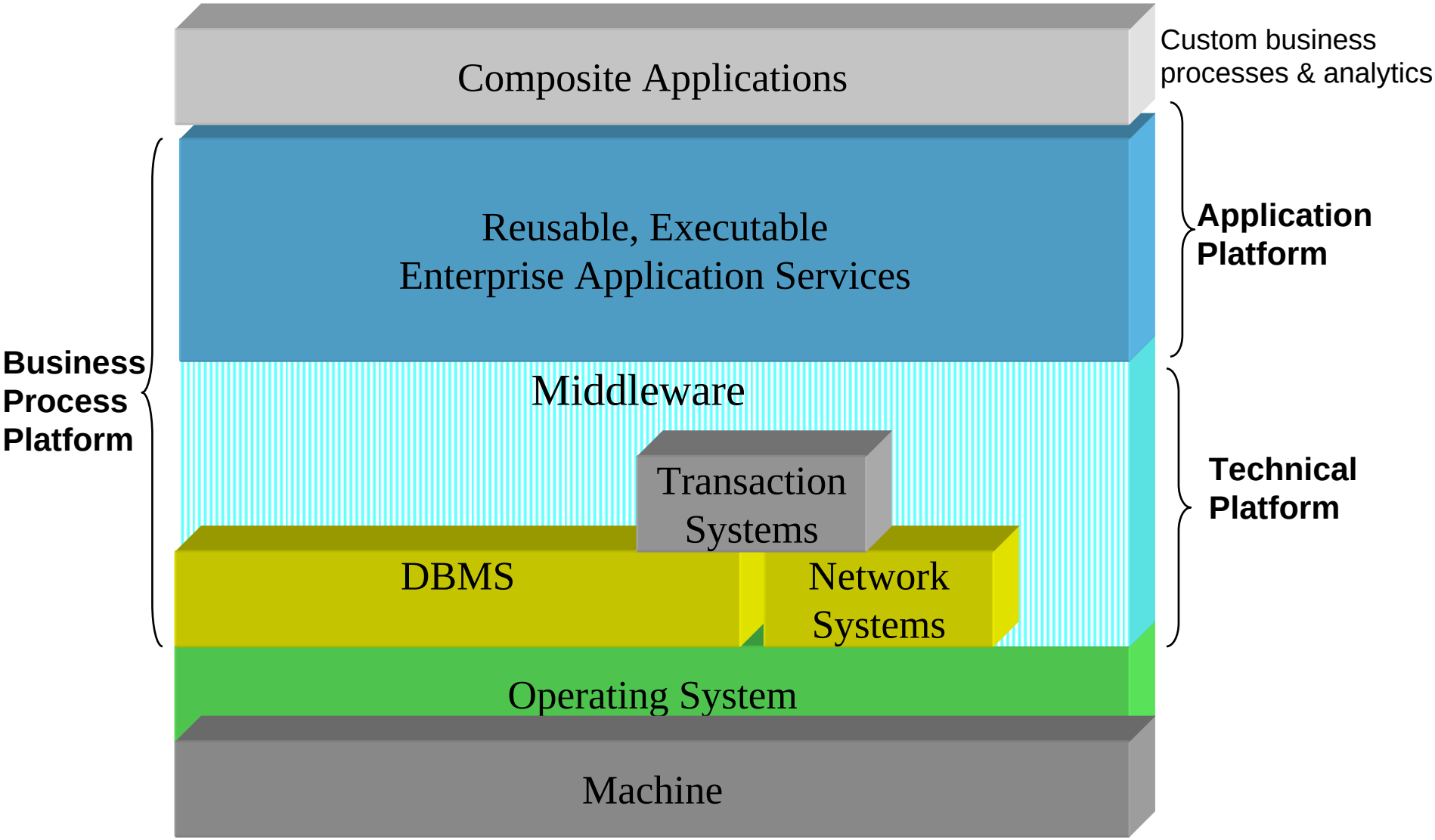
Business Process Platform
Raising the Abstraction Level of the Software Platform



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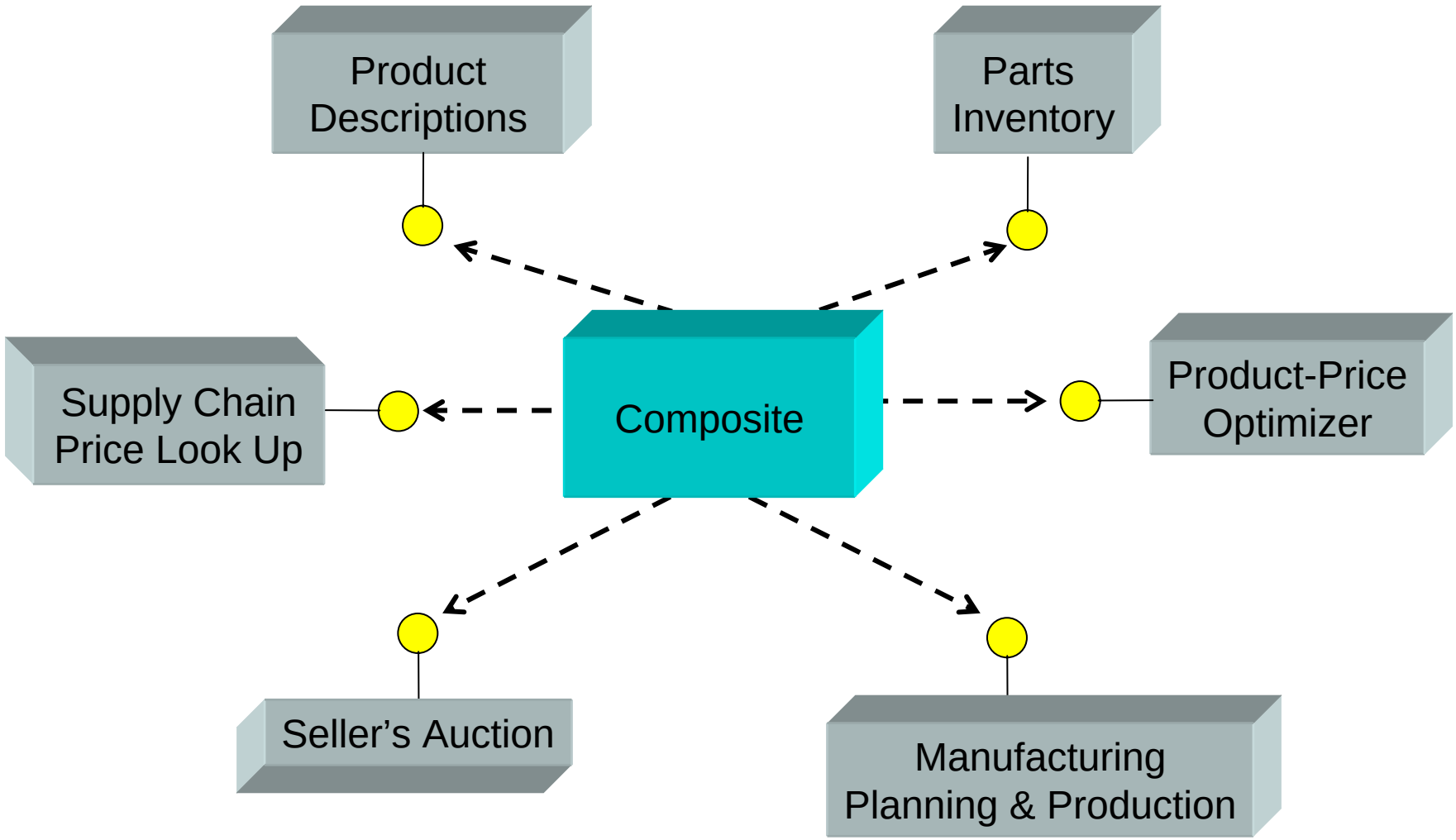
Composite App: Procure-to-Pay, Order-to-Cash, Manufacture-to-Inventory



David Burdett, SAP Labs

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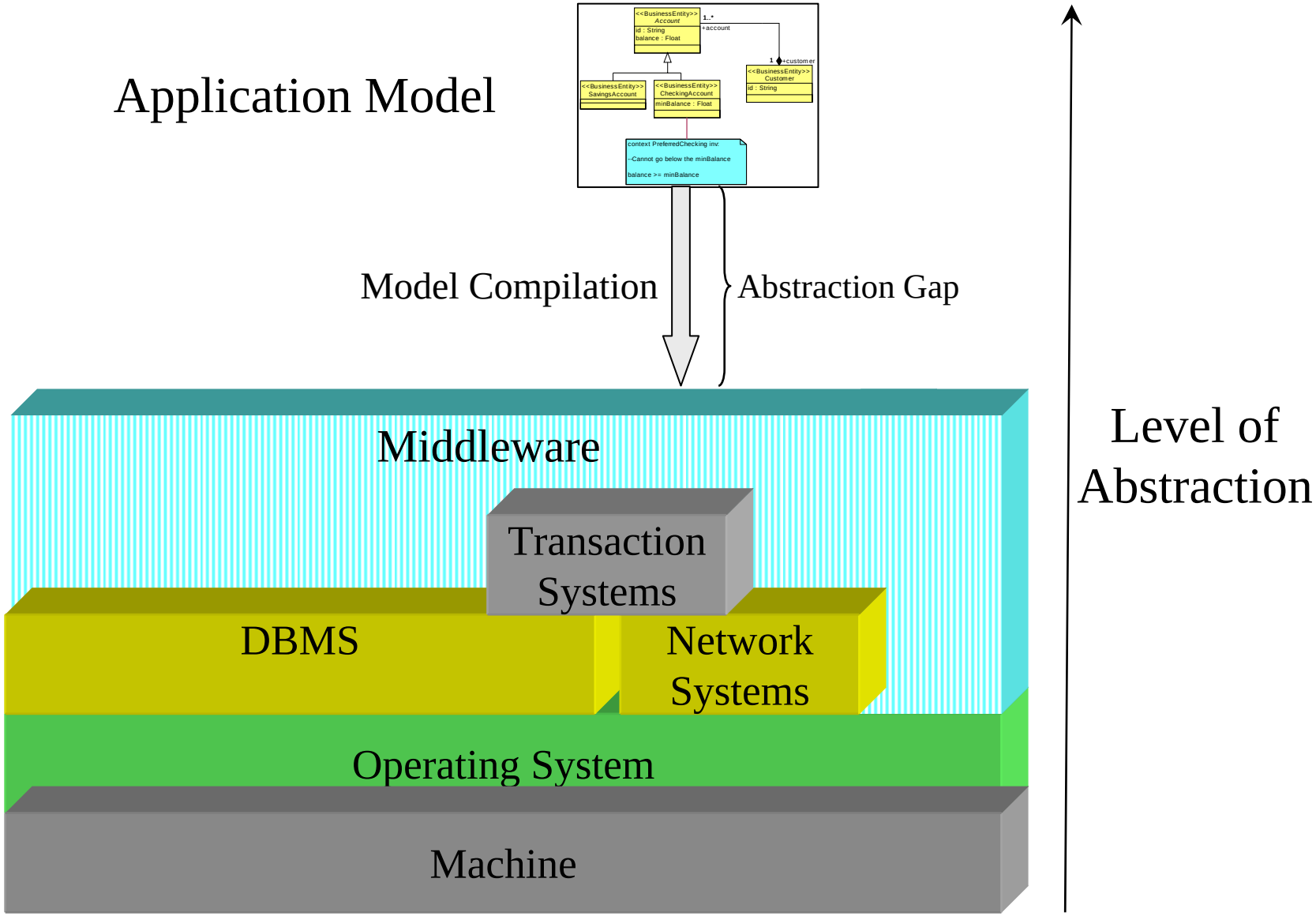
Model Compilers and the Abstraction Level



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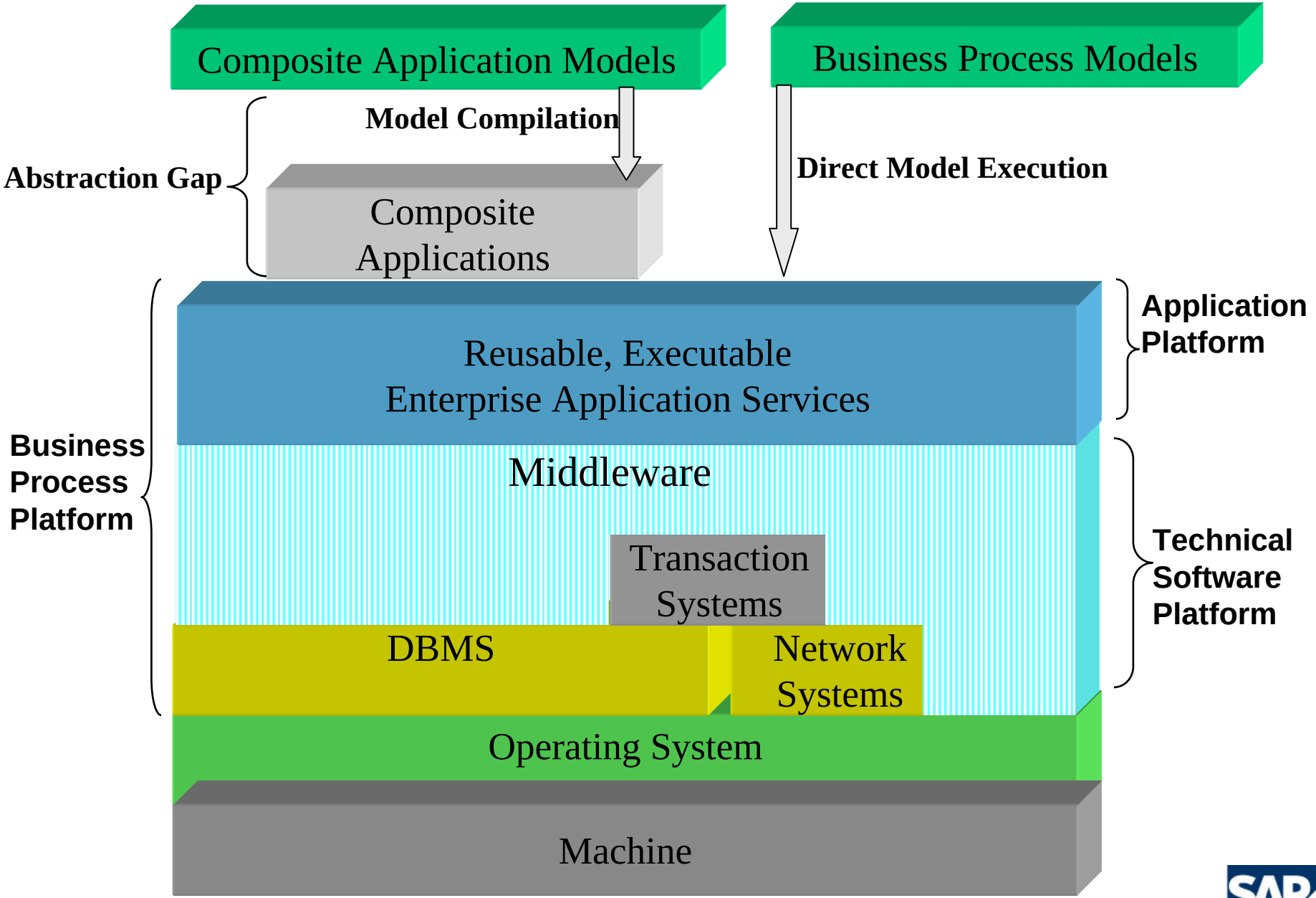
Model-Driven Tools
Empowering the Business Process Expert (BPX)



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This Will Not be an Easy Transition

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**

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As Service-Oriented BPPs Scale Up...

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

Configuration/version/dependency management problems do not go away

- They can even get worse

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A Metadata-Rich Environment

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
  - *Inferences do not have to be 100% certain to be helpful*
  - Let the human decide what to do
  - Record what the human decides
  - Show the next human what the others decided
  - Learn
  - Inference engines require languages for expressing metadata to be *formally grounded*

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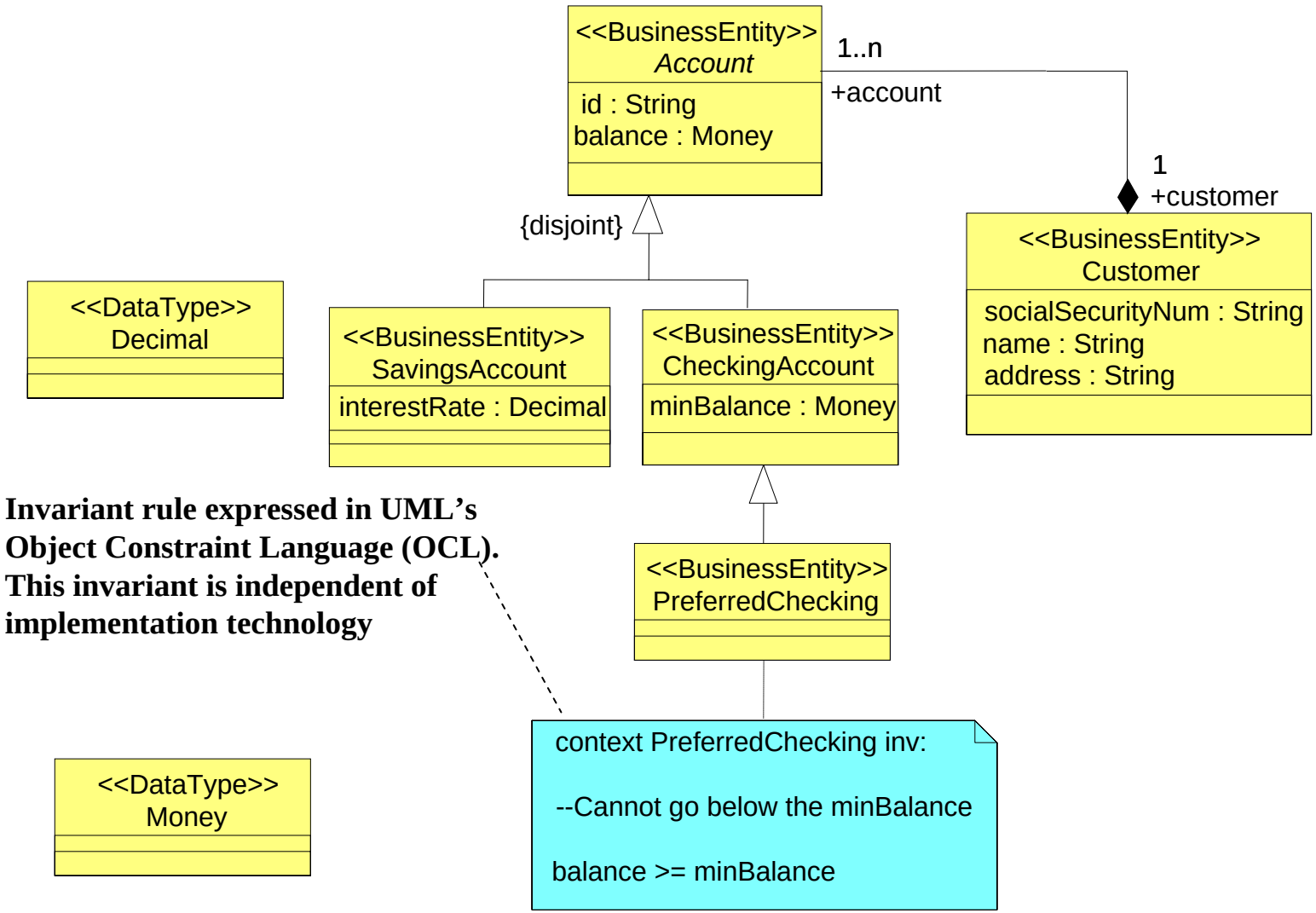
Abstract Business Information Model: IT Viewpoint
With an Invariant Rule



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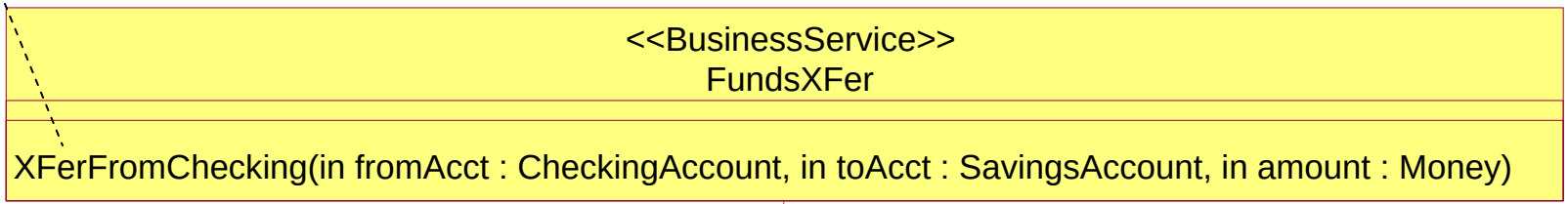
Abstract Model of a Business Service
With Pre-conditions and Post-Conditions

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 orginal 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

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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

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Configuration Invariants

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 support[1]

- *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

[1]Krzysztof 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.

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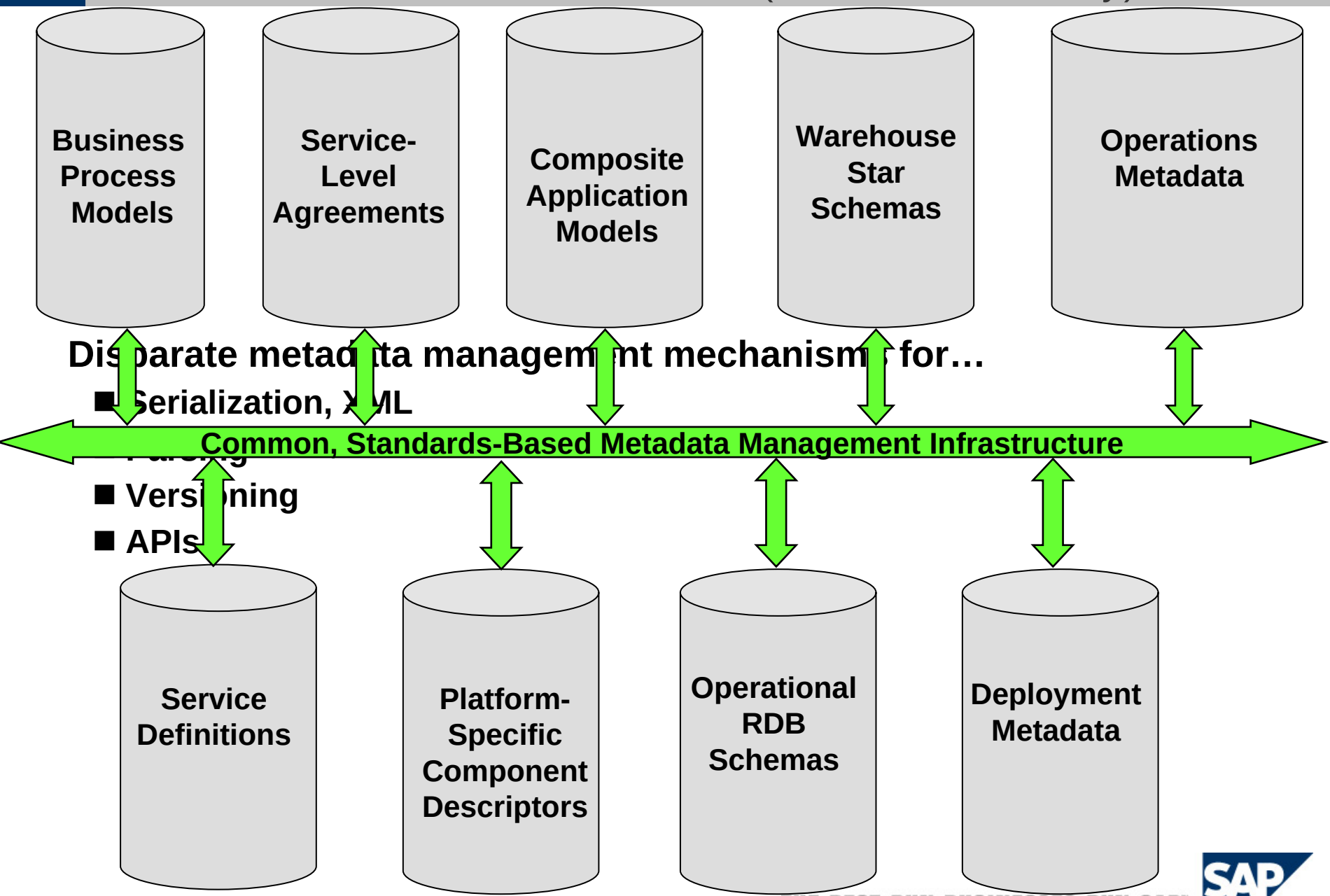
Metadata Across the Lifecycle
Model-Driven = Metadata-Driven (With Traceability)



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Summary

Business process platforms are coming

- **Transition will be gradual, but powerful**
- **Model-driven tools are important for making the platforms usable**
- **Providing business value today, more in the future**

Configuration management has to be faced square-on

Metadata-rich environments and formal grounding needed to manage the complexity

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

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Backup

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Another Scaling Up Challenge

How do you build reusable components?

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

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Product Line Practices

Individual Product 1 | Individual Product 2 | . . . | Individual Product n

Individual systems produced via *product development*

Production Plan

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

Architecture

Components

Specialized Compiler(s)

Domain-Specific Language(s)

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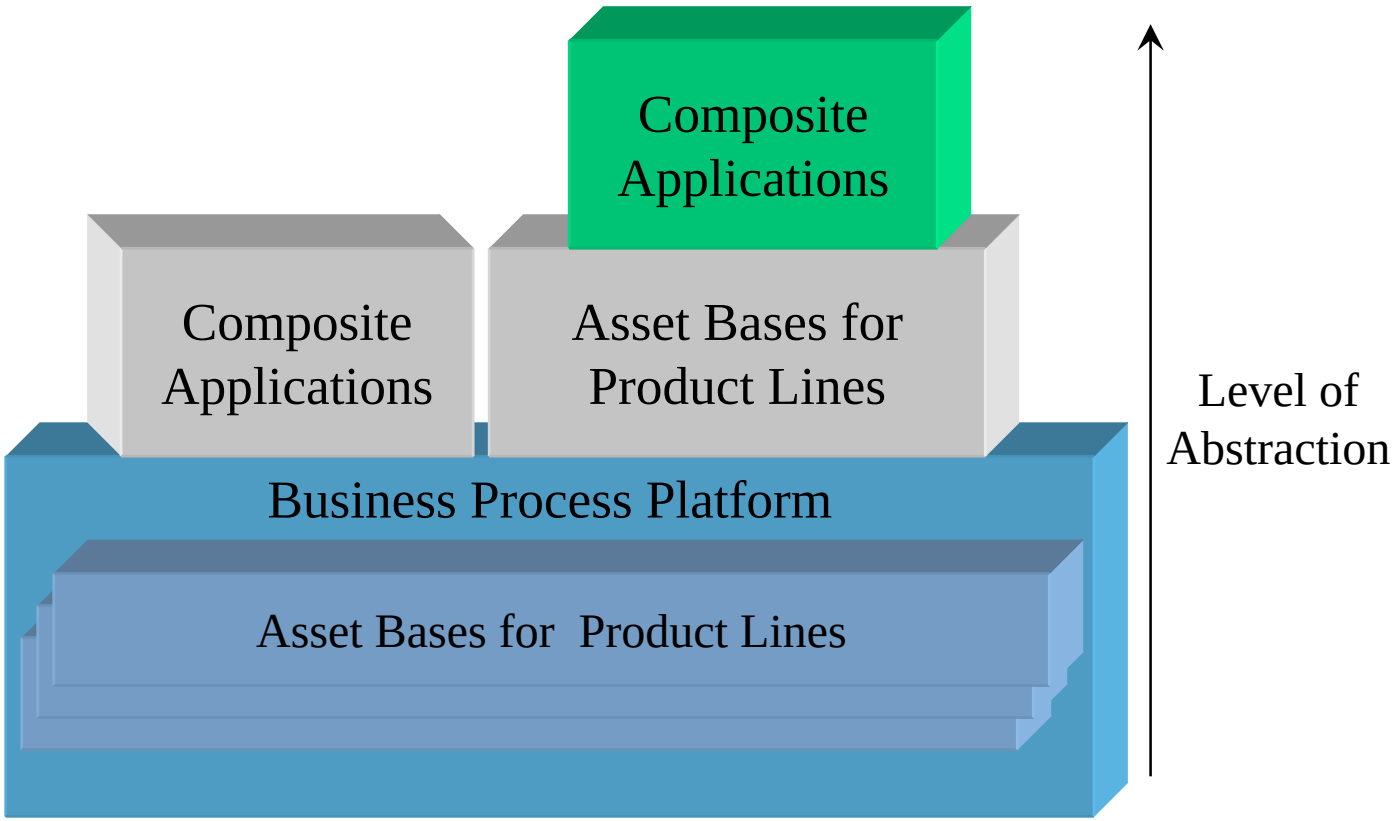
Applying Product Line Practices



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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

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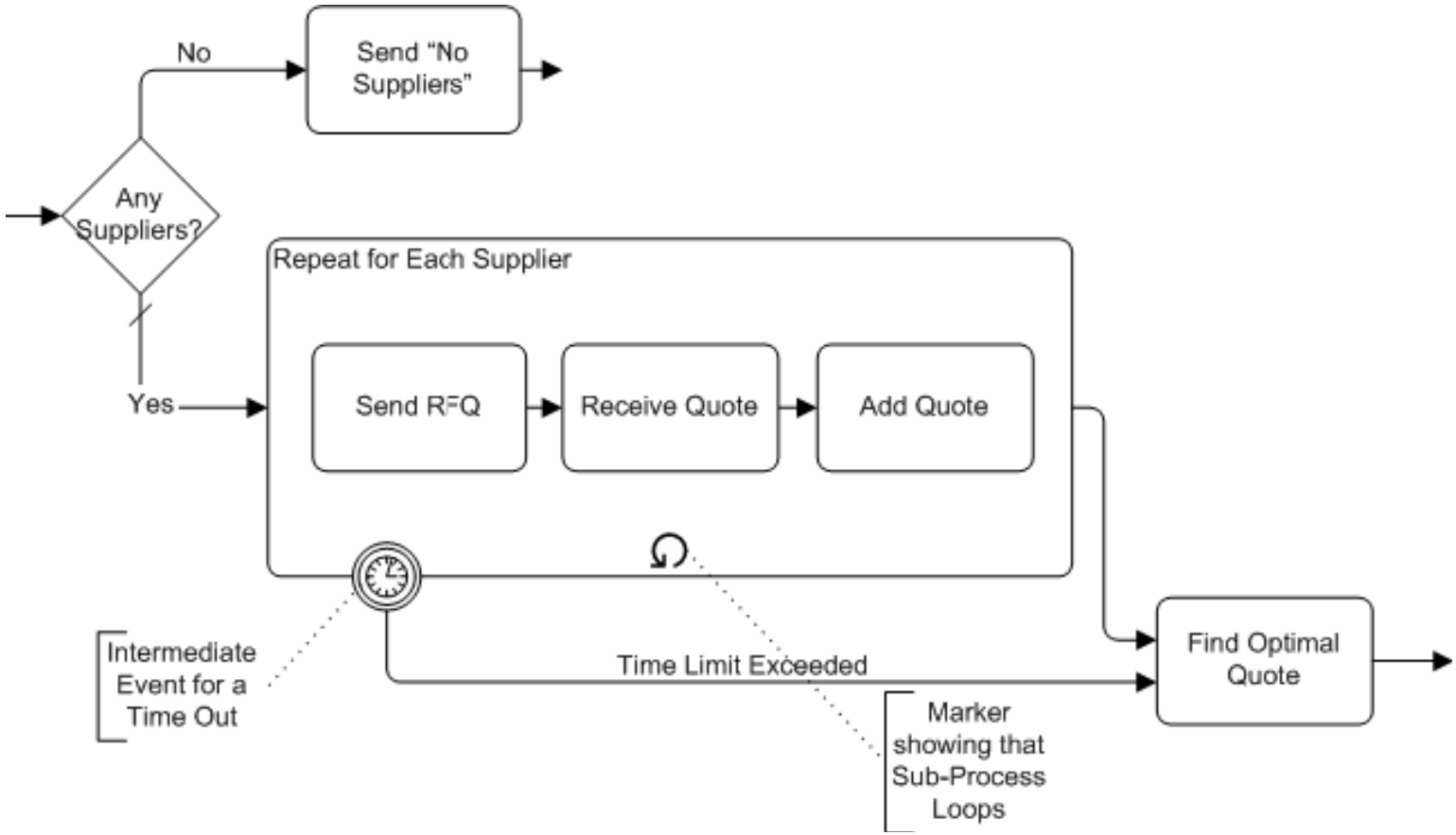
Business Process Modeling Notation (BPMN)



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

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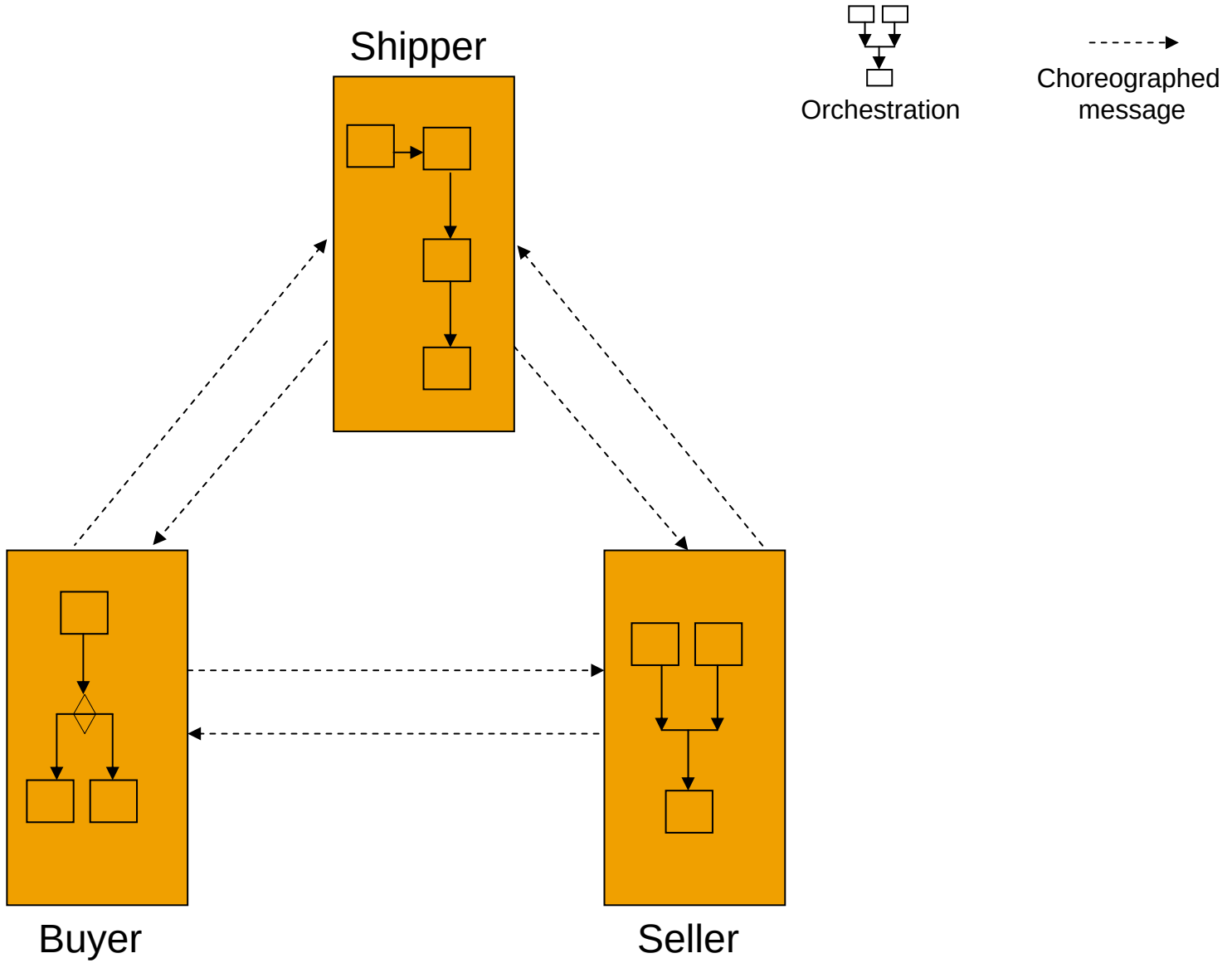
Collaborative Business Processes



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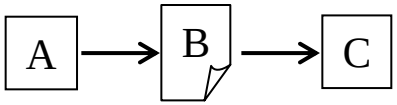
Seeking Formal Grounding for MDA
To Improve Automated Assistance



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

Ontology Definition Metamodel (ODM)

Generic UML Modeling Tool

UML Model Using UML Profile

Generic UML Model

Native Semantic Web Ontology Development Tool

UML-OWL Bridge

MOF/XMI Based Tooling (e.g. Semantic Web Eclipse Plug-In)

Native OWL Document

XMI OWL Document

ER Tool

OWL-XMI Bridge

ER-OWL Bridge

ER Model

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