

Second OMG Workshop on Web Services Modeling

Easy Development of Scalable Web Services Based on Model-Driven Process Management



Manfred R. Koethe
Chief Technology Officer

Outline

- ✿ Introduction to Web Services
- ✿ Introduction to Business Process Management
- ✿ 4-Tier Web Services Architecture
- ✿ The Role of the MOF
- ✿ Business Process Modeling
- ✿ Web Service Modeling & Generation
- ✿ Summary

Characteristics of Web Services

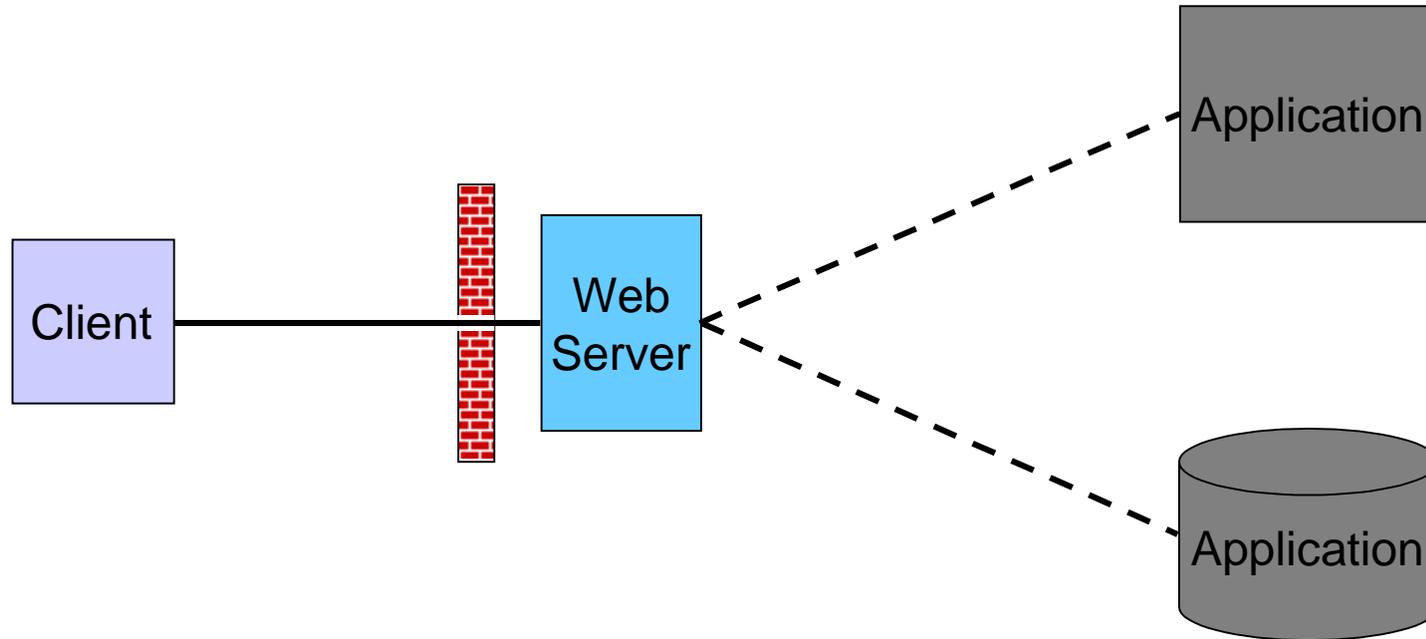
Web Services represent client-server architectures with these distinct features:

- ✱ Utilization of the World-Wide-Web infrastructure
- ✱ Utilization of Web protocols
- ✱ Minimum infrastructure requirements for the client side (“Thin Client”)
 - Web browser
 - Web-enabled application
- ✱ Required processing mostly concentrated on the server side

Existing Services on the Web (1)

- ✦ Are typically hard-coded
 - Scripts or local programming at the web server implements the desired functionality
 - Linkages to back-office applications are fixed
- ✦ May use HTML Forms or Java Applets to implement interaction with client users
- ✦ May use “Server Pages” technology to create dynamic content

Existing Services on the Web (2)

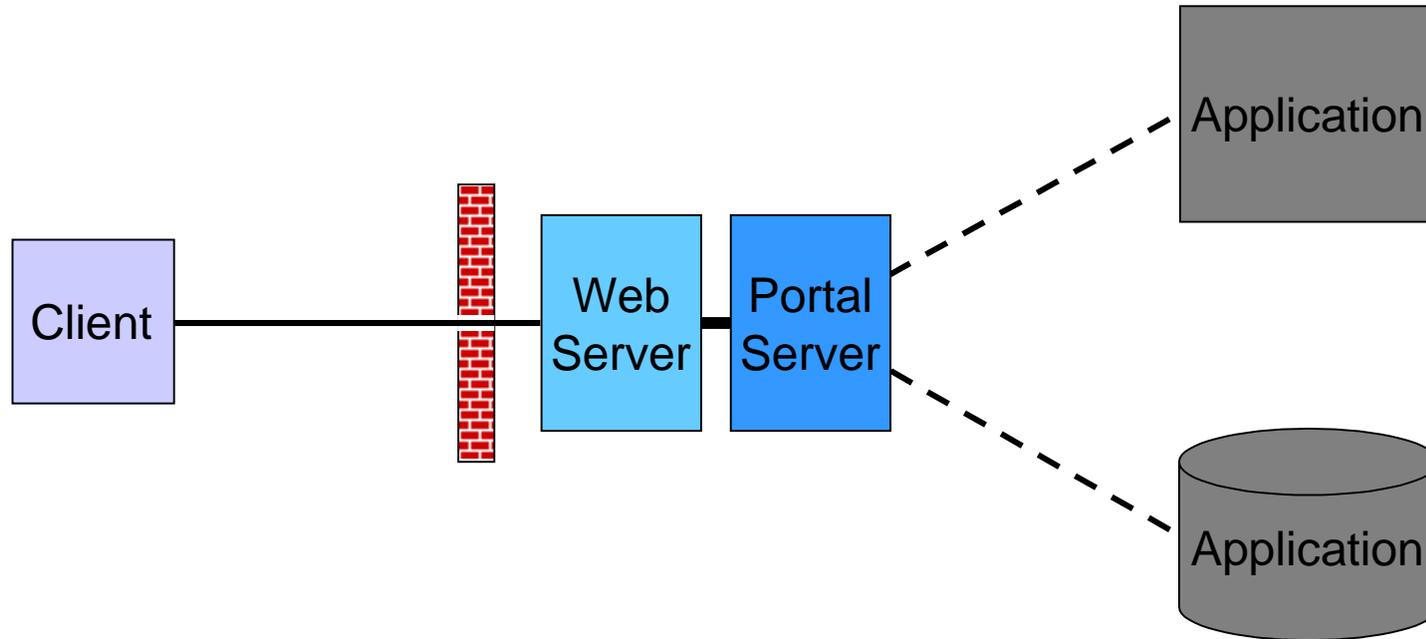


Existing Services on the Web (3)

This simple architecture has a set of disadvantages and problems :

- ✱ Any change requires programming
- ✱ Number of back-office services and their locations typically fixed after web server programming has been completed
- ✱ Limited growth potential
- ✱ Limited scalability
- ✱ Security only as good as firewall

Adding a Portal Server (1)



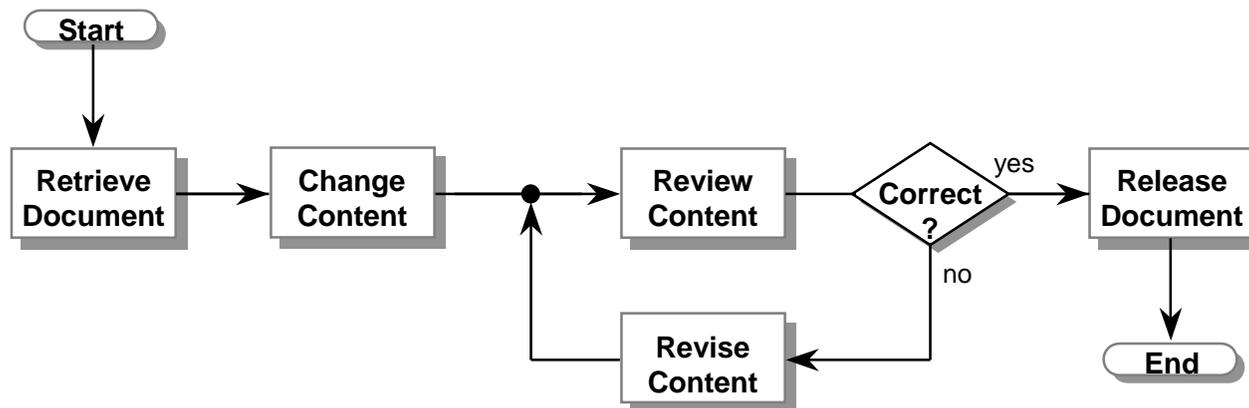
Adding a Portal Server (2)

The addition of a portal server results in improvements compared to the simple architecture:

- ✱ Decoupling of web server from applications
- ✱ Greater flexibility in application integration
- ✱ Support for dynamic web presentation
- ✱ More options to handle security
- ✱ But still limited scalability
- ✱ Still needs programming for any change

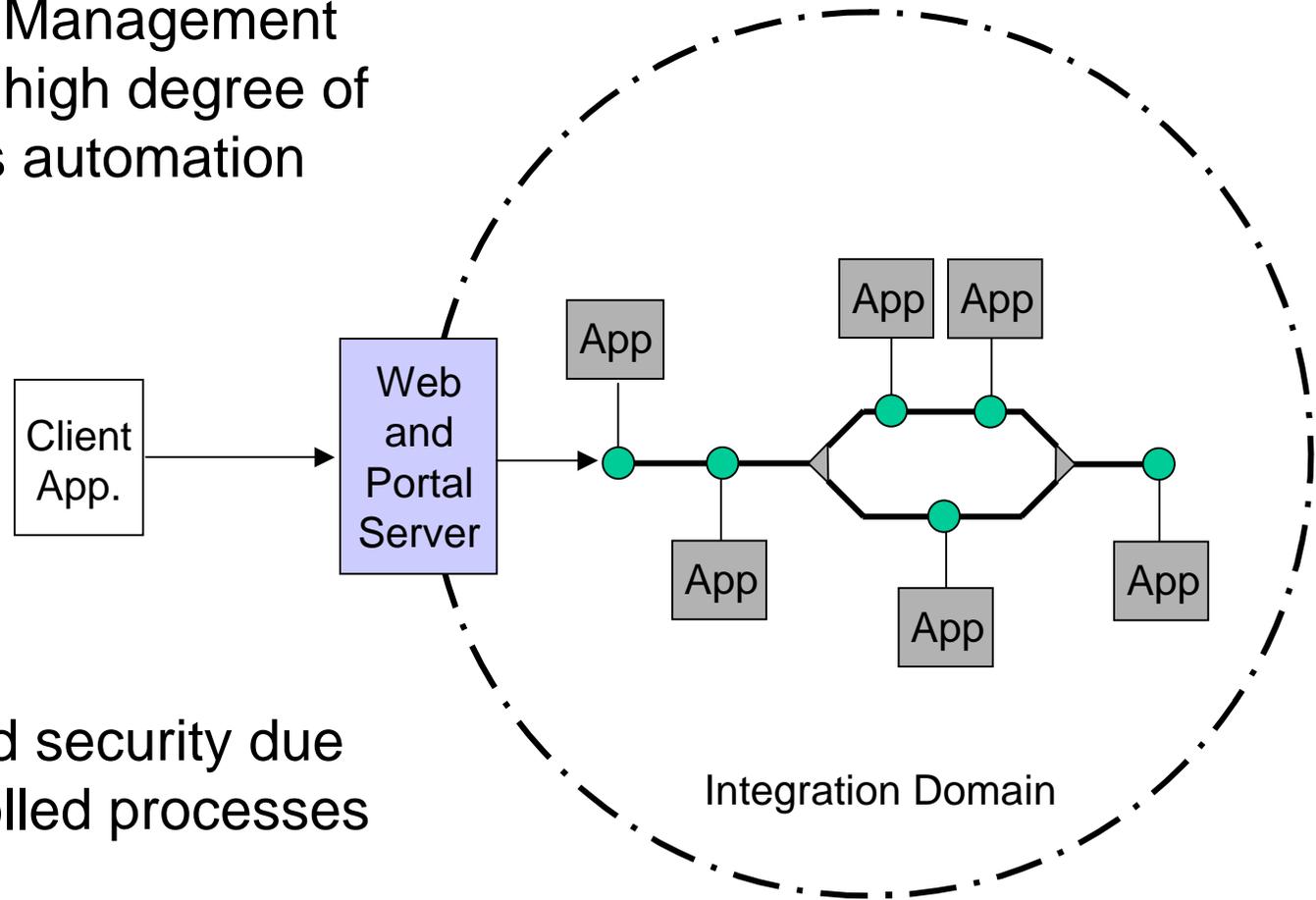
Business Process Management (1)

- ★ A technology successor of Workflow Management
- ★ Allows to model sequences of actions, possibly involving a flexible set of multiple applications
- ★ Supports rapid service creation with no or minimal programming
- ★ Provides a high degree of flexibility



Business Process Management (2)

- Process Management allows a high degree of business automation



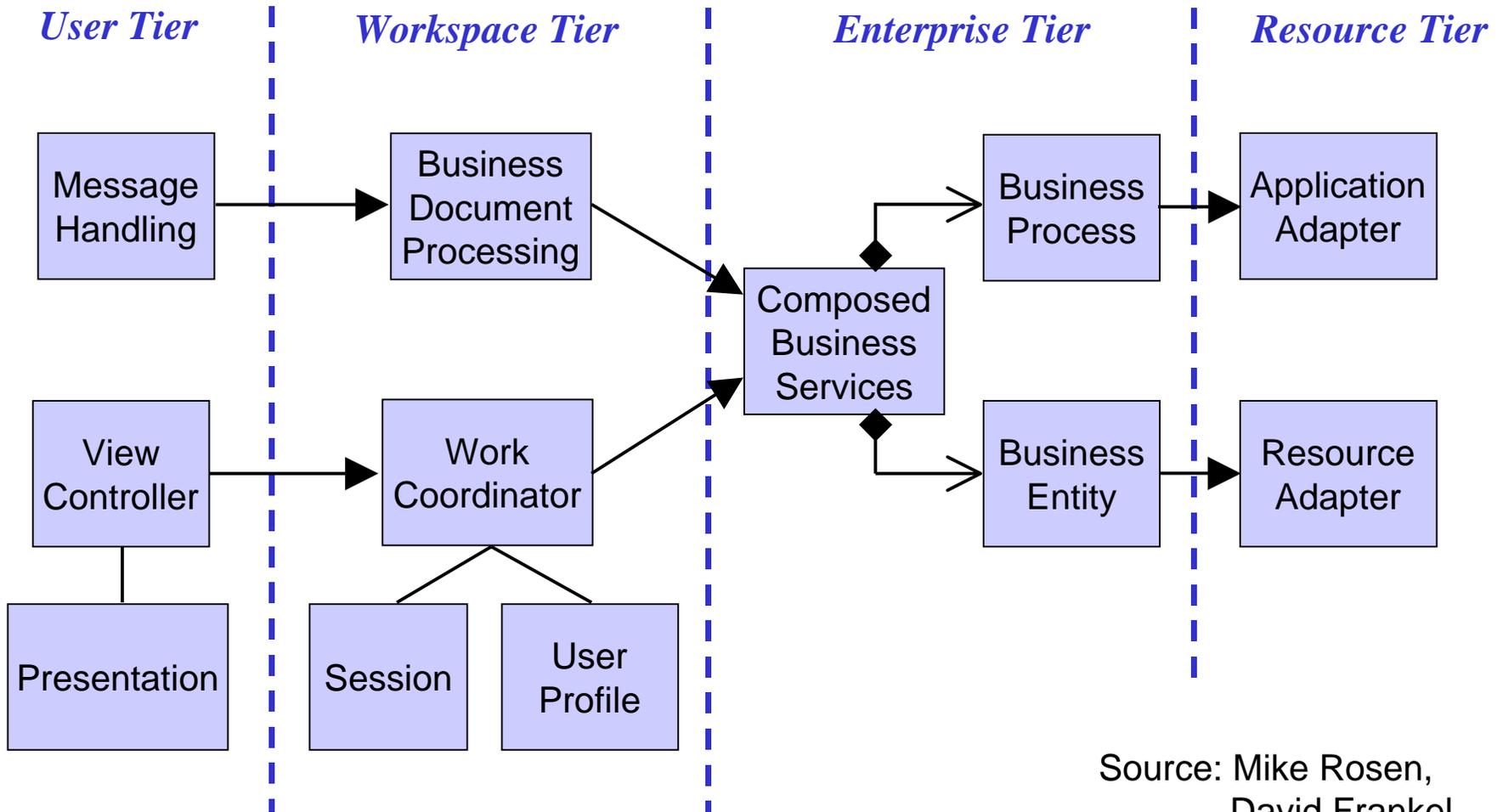
- Improved security due to controlled processes

Business Process Management (3)

So, now where is the catch?

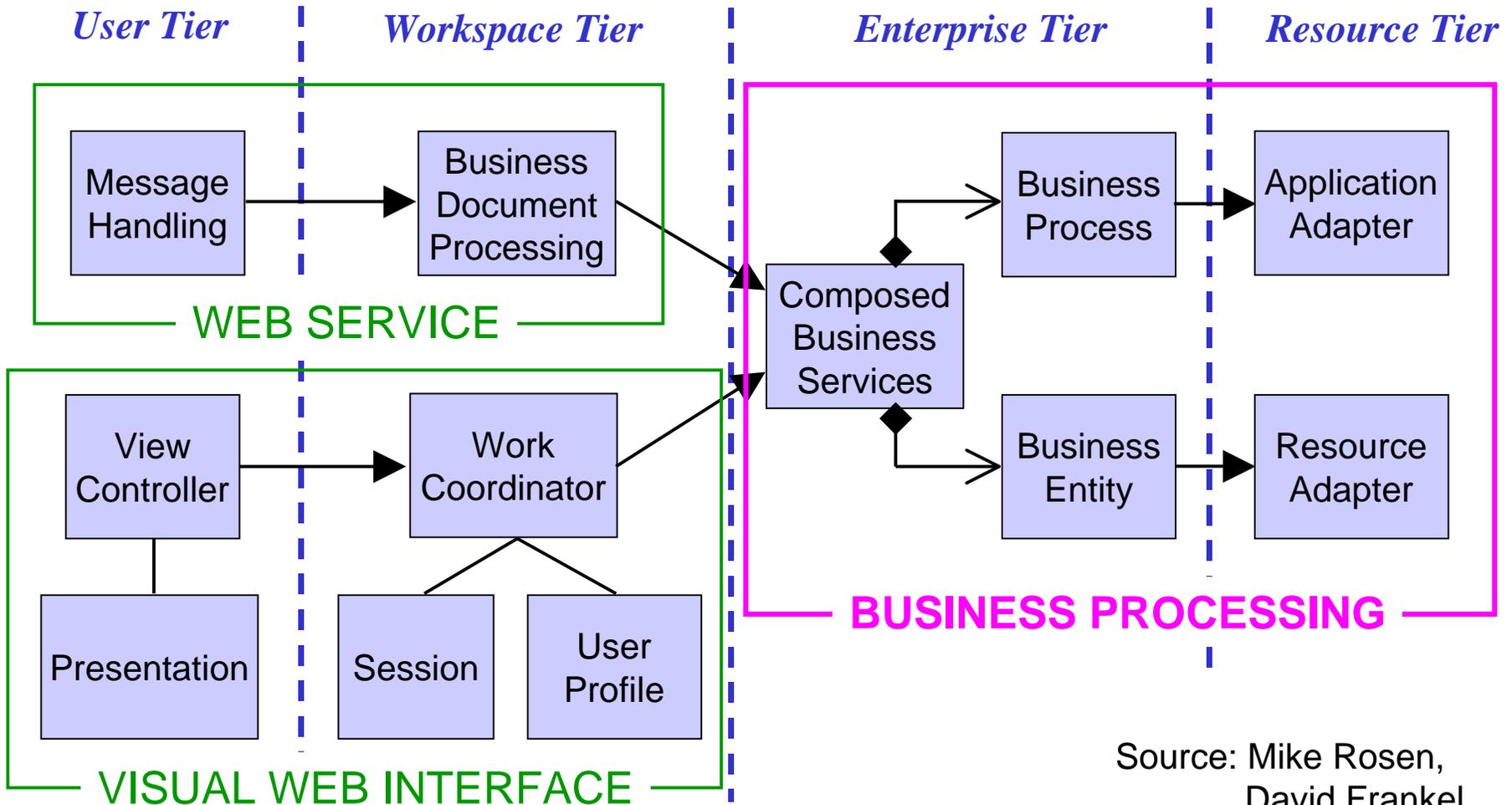
- ✱ Currently there exists a substantial number of (incompatible) standards for business process management
- ✱ Previous attempts to unify these standards have failed
- ✱ The most promising approach for harmonization is through meta-modeling techniques (as promoted by the OMG)...
- ✱ ...and supports automation of Web Service development

4-Tier Web Services Architecture



Source: Mike Rosen,
David Frankel

4-Tier Web Services Architecture

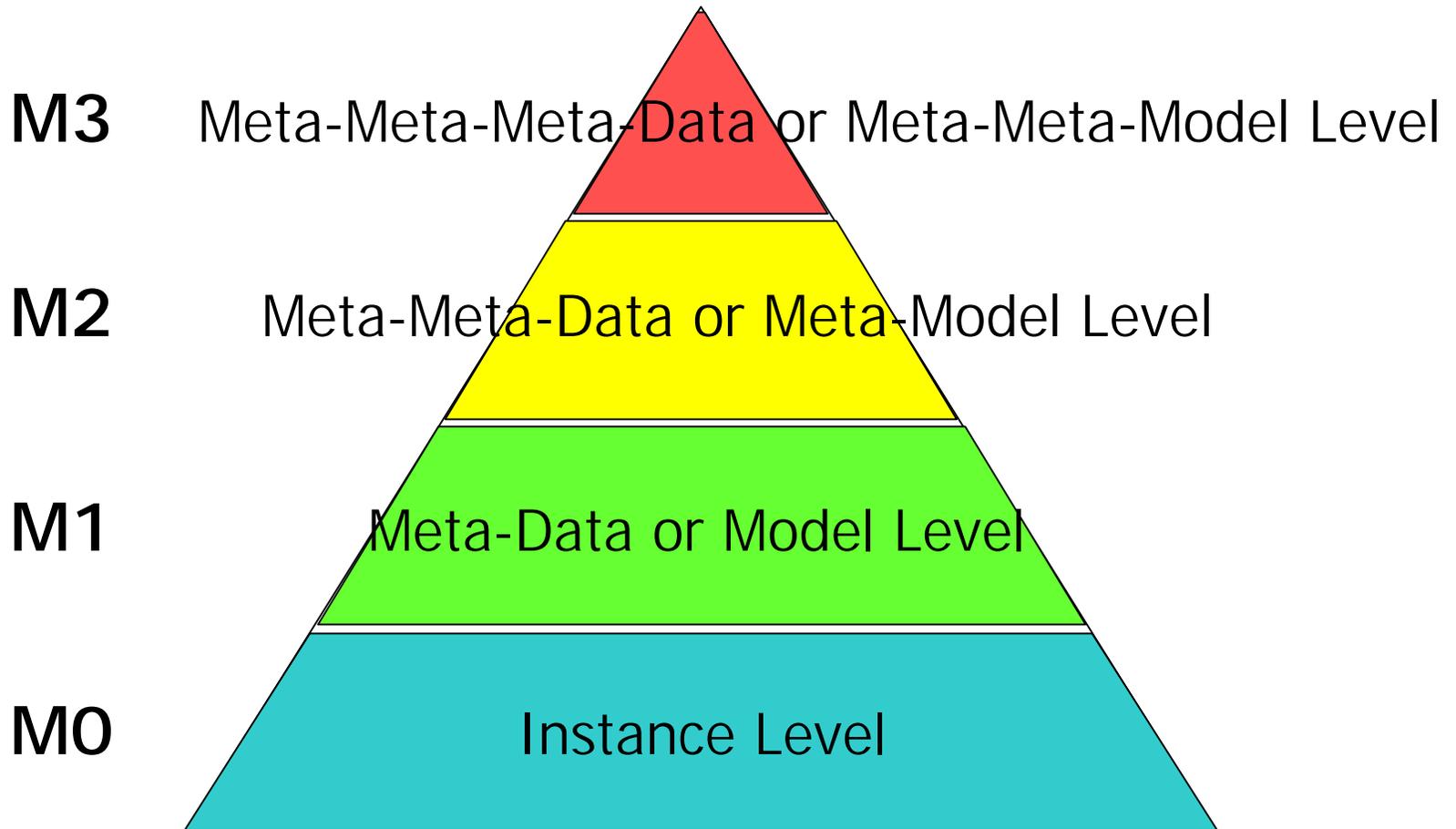


Source: Mike Rosen,
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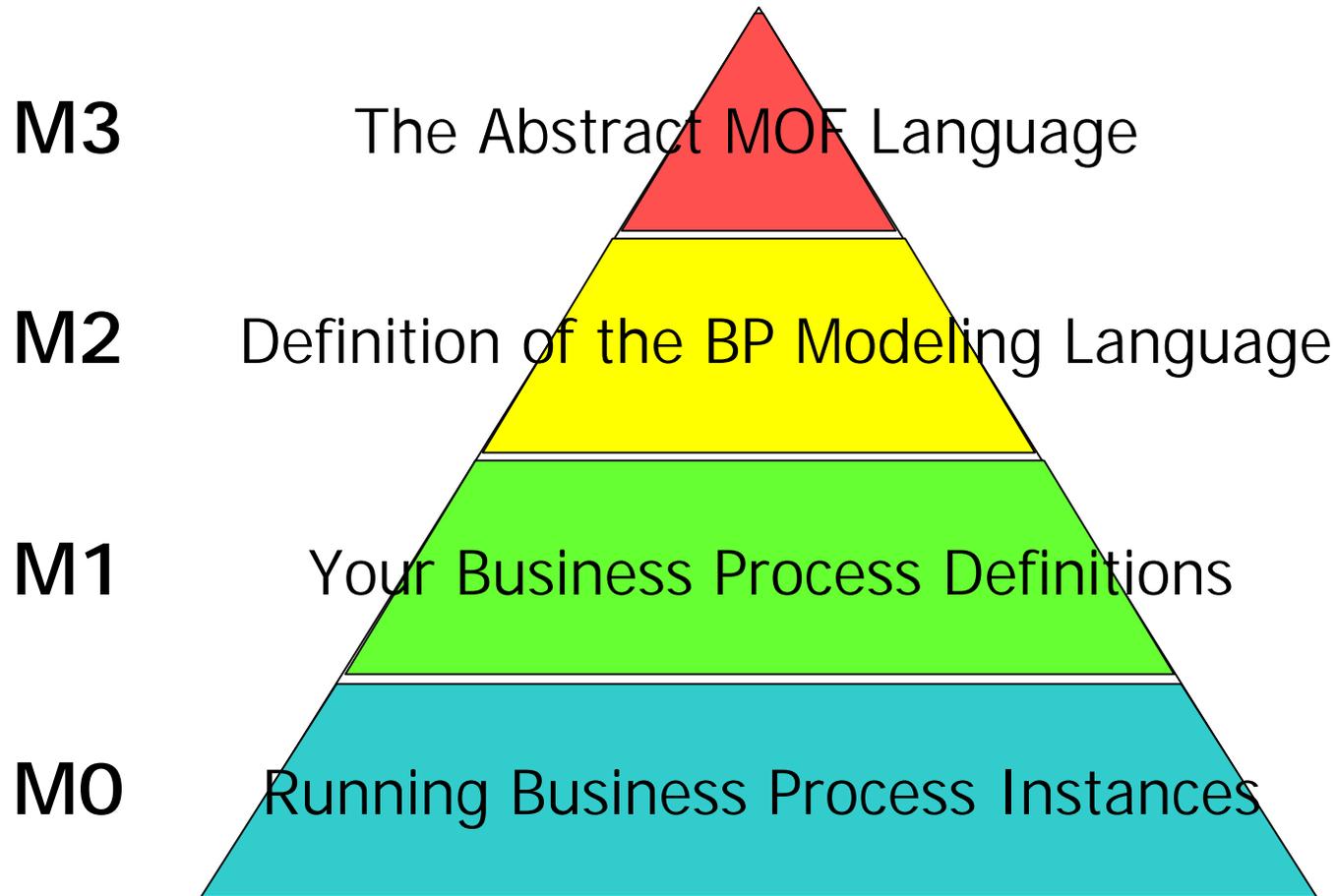
The Importance of Metamodels

- ★ The key to the Model Driven Architecture (MDA) technology are not models but metamodels
- ★ Metamodels represent a formal language for the definition of corresponding models
- ★ This formal language allows an automated creation and interpretation of models without the need for model-specific programming
- ★ The Meta Object Facility (MOF) manages a hierarchy of metamodels and models; it is the most important building block in the MDA landscape

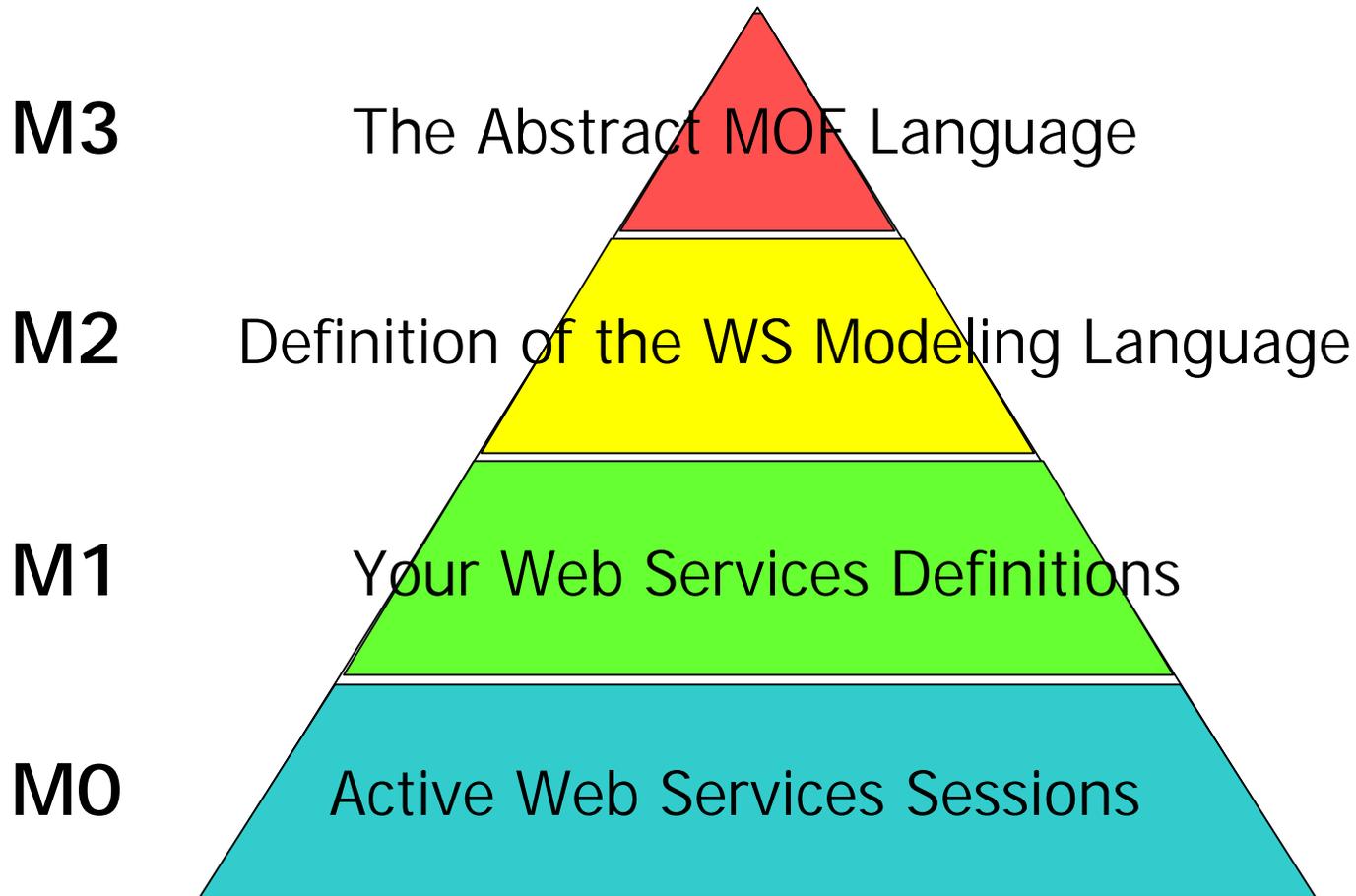
The 4-Level Meta-Architecture



The 4 Business Process Meta Levels



The 4 Web Services Meta Levels

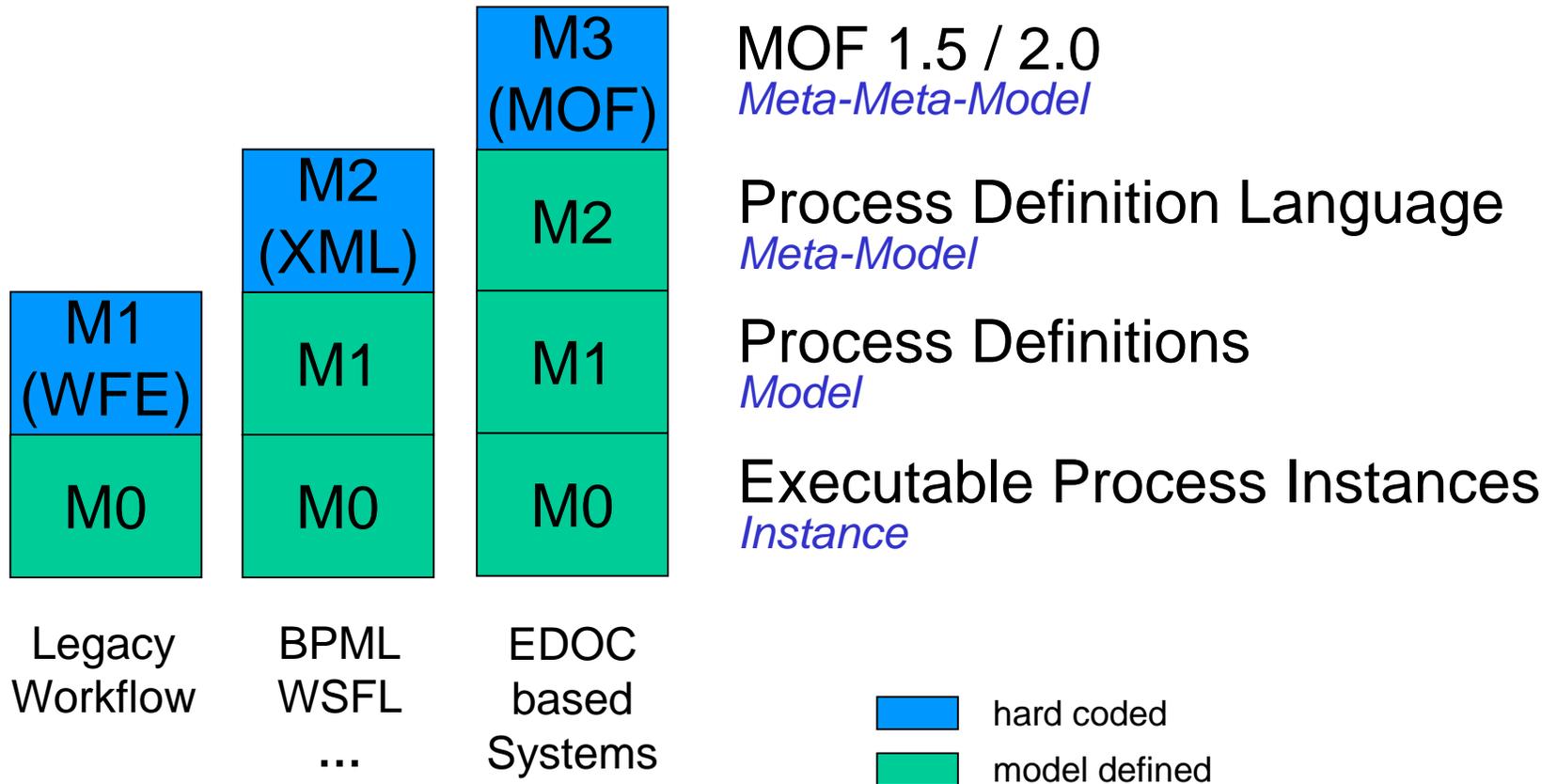


The MOF Advantage

If we can define multiple modeling languages using the same abstract MOF language, then we can:

- ✿ Use an arbitrary number of modeling languages, if necessary (Provided they are semantically compatible)
- ✿ Build model transformations residing in the MOF on M2 level
- ✿ Build code generators processing M1 models under control of the corresponding M2 metamodel
- ✿ Manage the whole system out of a single modeling facility

Business Process System Evolution



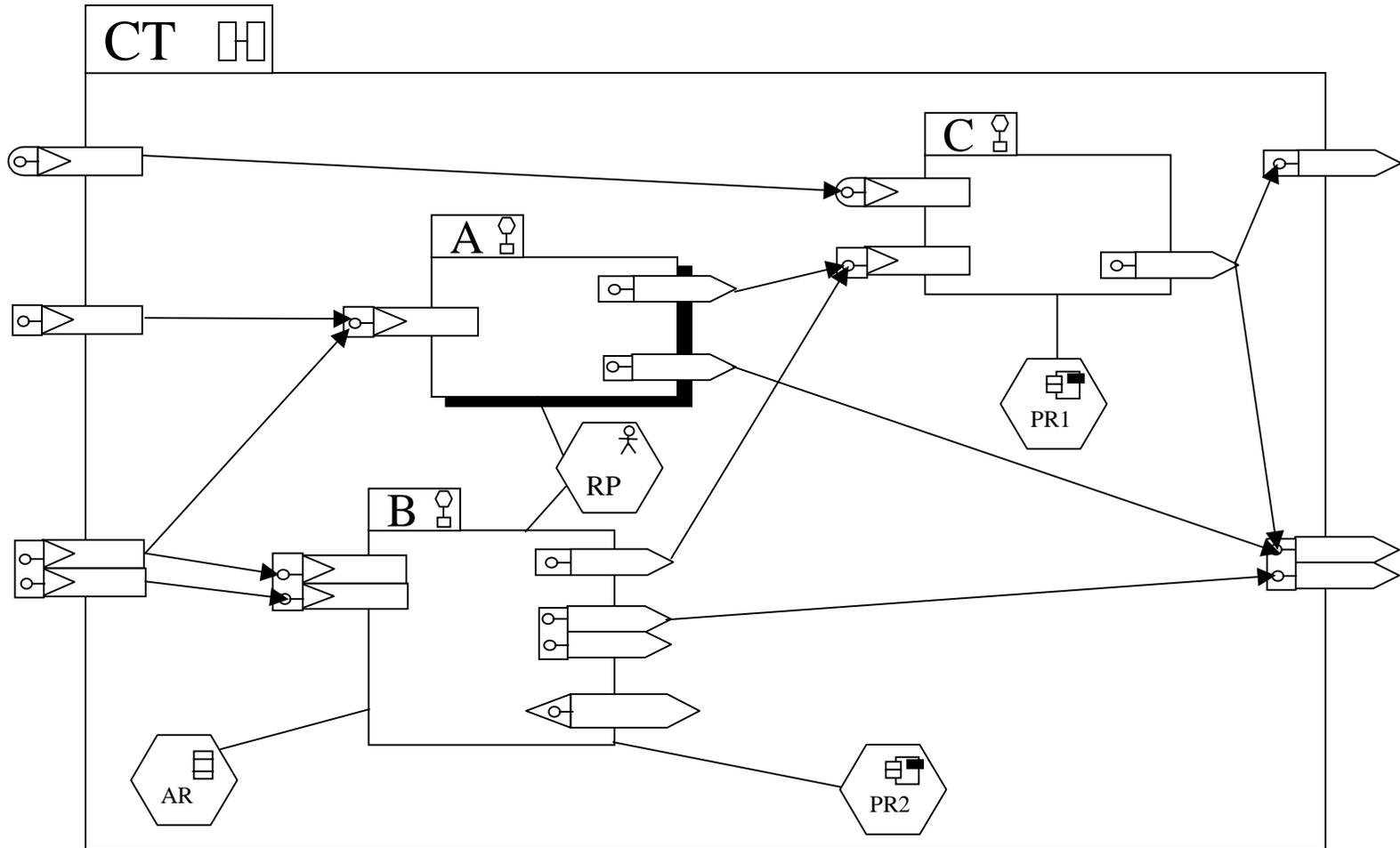
Modeling the Business Process (1)

- ✱ Modeling of business processes must be on Business Component level, not on Class / Attribute / Operation level
- ✱ Plain UML is not favorable, too low level, but:
- ✱ Specialized UML Profiles or MOF Metamodels will be very efficient
 - Most promising: UML Profile for Enterprise Distributed Object Computing (EDOC)
- ✱ Specialized tools based on these model may provide enhanced functionality and convenience

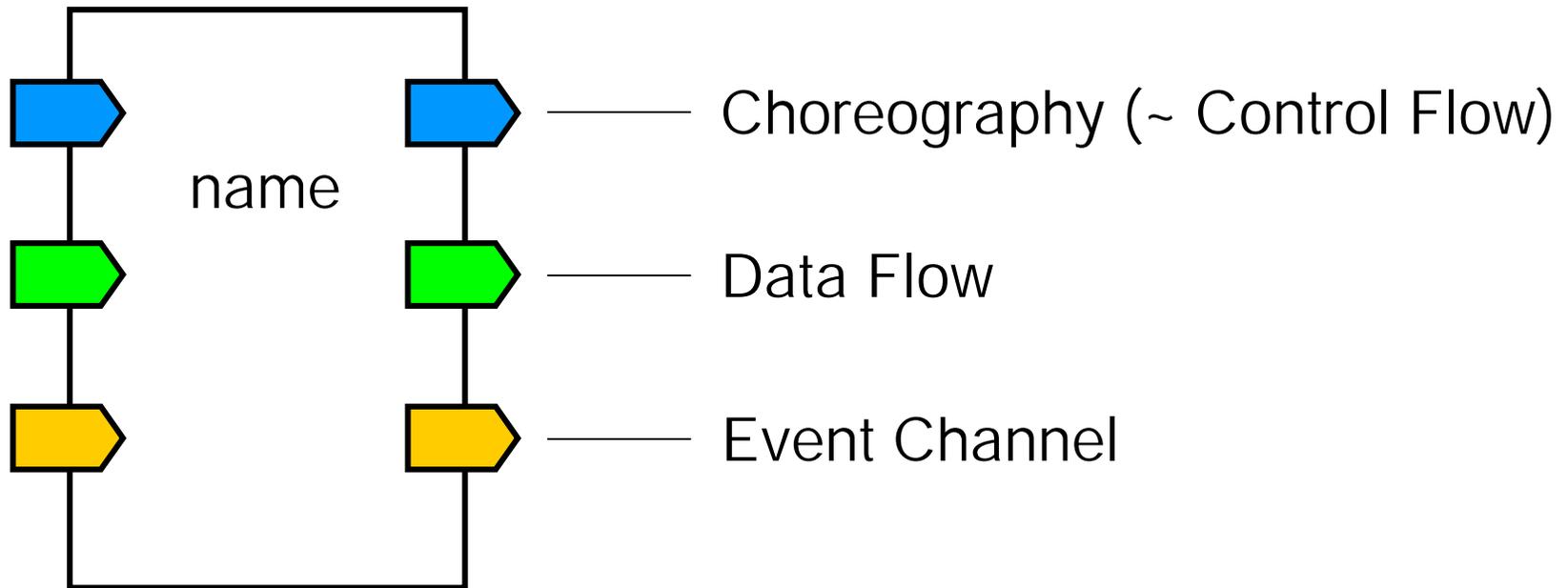
Modeling the Business Process (2)

- ✱ Business components are re-usable building blocks
- ✱ Wrapped applications
- ✱ Components embedded in a container system
- ✱ ...
- ✱ Creation of a business component may be a substantial task, but is a one-time effort

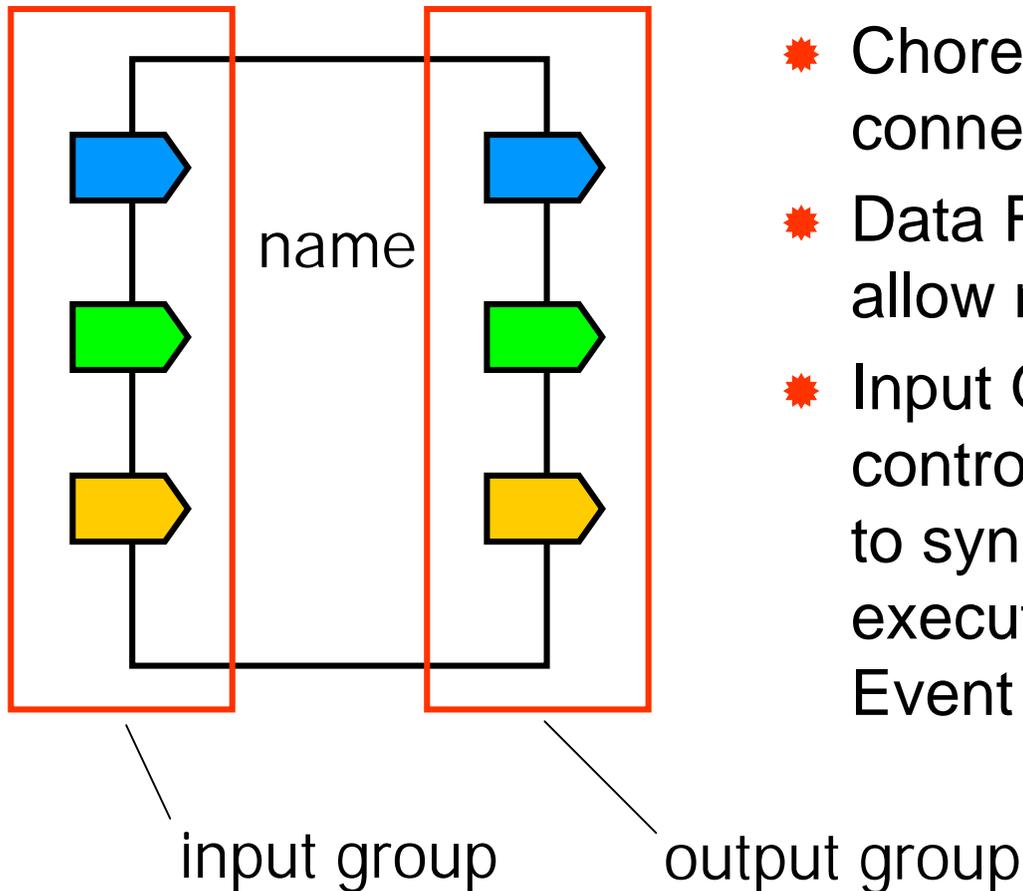
EDOC Business Process Notation



Our Simplified Activity Symbol (1)

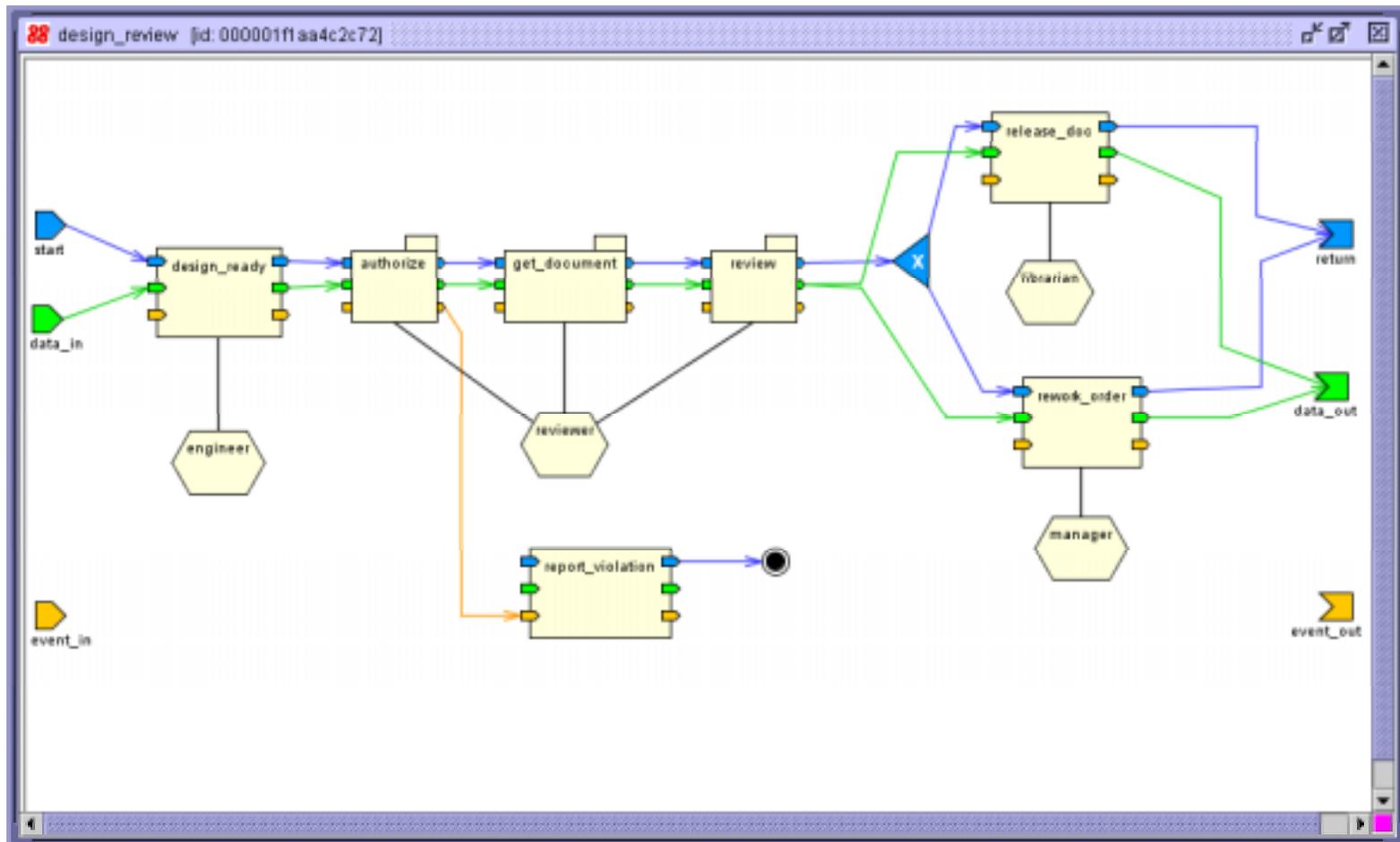


Our Simplified Activity Symbol (2)

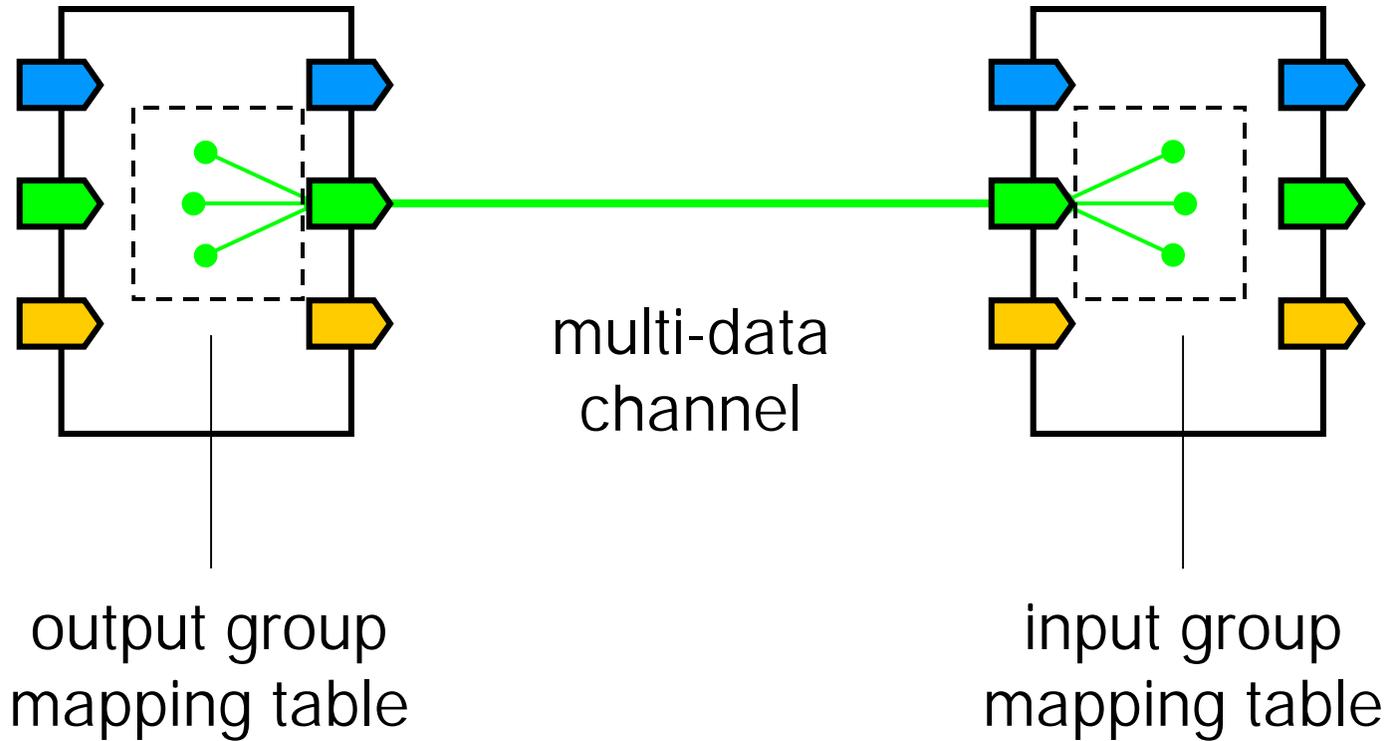


- ★ Choreography is single connection only
- ★ Data Flow and Event Channel allow multiple connections
- ★ Input Group and Output Group control pre- and post-conditions to synchronize Activity execution with Data Flow and Event Channel

Our Simplified EDOC Process Notation



Data Flow Details



Web Service Modeling

- ★ Web Services messaging can be expressed as business process interaction
- ★ The same is true for the web presentation
- ★ The graphic aspects of the presentation can be covered by specialized components

- ★ The complete service can be modeled in the MOF
- ★ The MOF can feed models into translators to web languages (like WSDL), controlled from M2 level

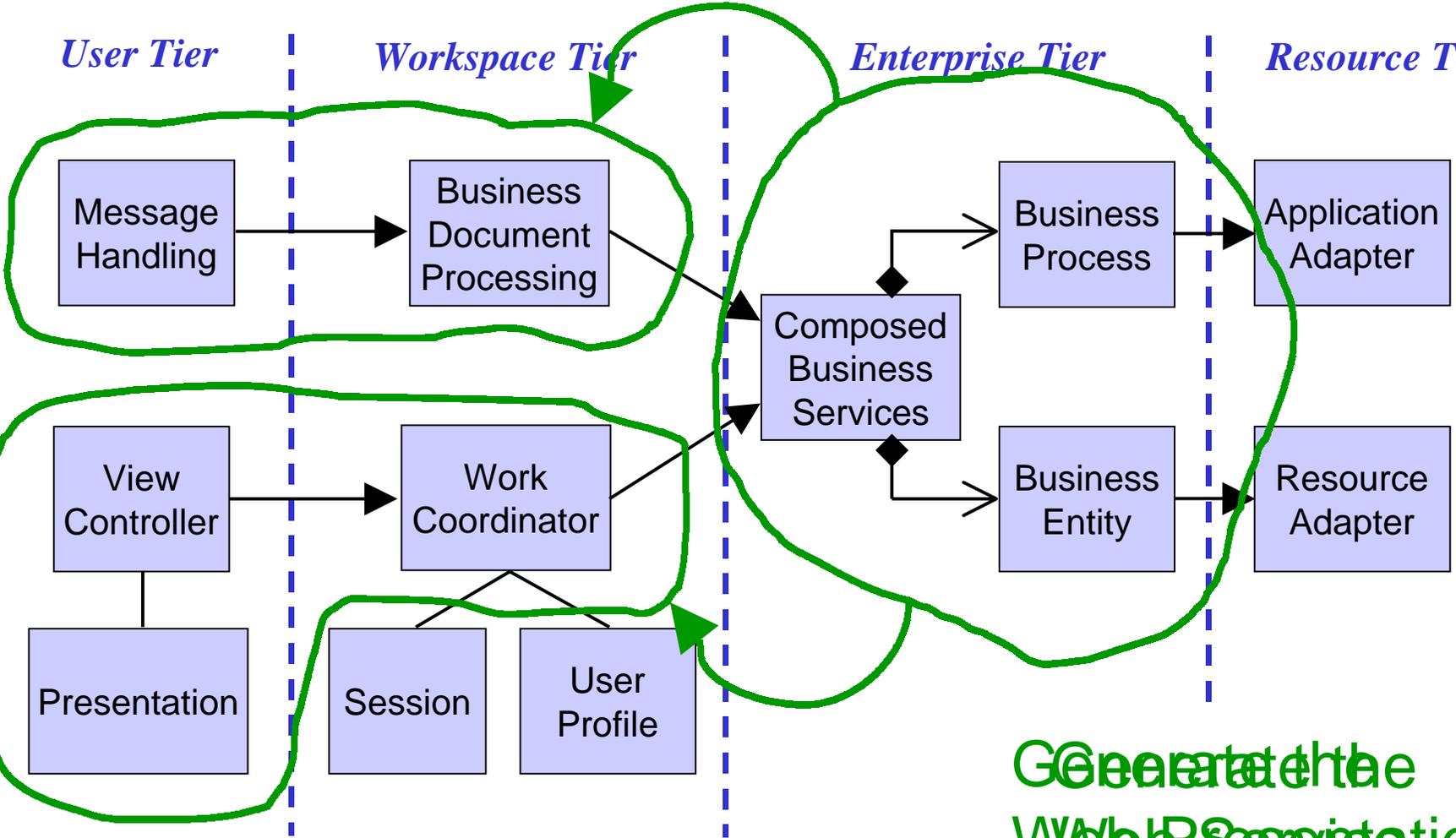
Generate the Web Service

User Tier

Workspace Tier

Enterprise Tier

Resource Tier



Generate the
Web Presentation

State of the Art and Standardization

- ✿ UML Profile for EDOC is an adopted OMG specification; several implementations exist
- ✿ EDOC-based process modeling and management systems exist
- ✿ A unifying business process metamodel is in development
- ✿ MOF is a formal OMG specification; several implementations exist
- ✿ Formal MOF-based model transformations is in development
- ✿ EDOC to WSDL mapping is in development

Summary

- ✱ Metamodels and the MOF play an important role in the automated generation and operation of web services
- ✱ Individual web service functions can be modeled as business processes (based on EDOC)
- ✱ Graphic aspects of a web service will be represented as business components attached to the business process
- ✱ All web service description, messages and presentation can be generated from the MOF representation

Thank you ...

Questions?

For Further Information:

E-Mail: koethe@88solutions.com

<http://www.88solutions.com>