Digital Business Ecosystem

Market Watch

Emerging Standards and Practices

Focus on BML
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Challenges in BML Issue
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What is BML ?
BML stands for "Business Modelling Language"

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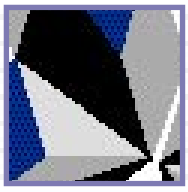

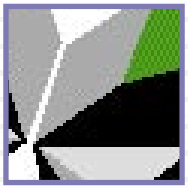

Market Watch

Focus on BML

Lead author Peter Stanbridge

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The objective of this issue is to provide information about BML to the DBE project team, which needs to be kept updated about the role of the BML, but are relatively new to the subject. Market Watch may also be provided to the ICT for Business Unit within DG Information Society. We are not making the assumption that we can educate the BML team on technical aspects, though we hope that we are widening the scope and bringing in information that is not currently available within the team.

Welcome to Market Watch : FAQs

What are the Market Watch objectives?
The Market Watch (MW) is a DBE deliverable (WP 34) and has as its main objective to inform the DBE community of emerging standards and practices in information technology (IT) and e-business and to engage consortium partners in any standards development wherever considered desirable.

How will Market Watch be published?

MW will publish in three forms. Firstly, a pdf document delivered by DBE project office to the project team and the EC. Secondly, content will be posted on the DBE intranet and thirdly, under certain circumstances to the DBE public website.

What is Market Watch for?

The publication is designed to inform readers of new developments with the exception of those partners already deeply engaged in MW areas, where informative surprise is likely to be almost impossible. We hope that in such situations, the informed reader will gain some new insight at least in the simplification of communication, impact for training or connection with the DBE project.

Why is Market Watch important?

It is primarily because 6th Framework Projects such as DBE are large research projects which require interaction with standards and standards organisations to be effective in long-term sustainability. European research should adopt important standards, avoid re-inventing the wheel and show the world that its research output is innovative enough to influence the forward movement of standards evolution. The same principle applies to e-business practices, especially where advances in current practices need to be made transparent to the DBE project.

How is Market Watch produced?

Topics are researched and selected by the MW editorial team, who are IBM (Peter Stanbridge, Jonathan Sage and Chris Catrie)

and FZI (Ines Alves de Queiroz) and other members from the DBE team according to the special topic under discussion. Secondly, MW will continually obtain feedback and accept requests for additional topics from the MW readership. Following research and selection, final decisions on what goes into MW will be made by the MW editorial board, which is the editorial team plus several members of the PMEB, who have volunteered to take this role (currently Andrea, Petri and Jonathan).

How will topics be covered?

All research results will be published on the Intranet, while selected publications will be published on the public website. The Commission publication, which will form the most formal of our delivery, will be in the form of monographs. Originally, the MW team considered publishing a wide mixture of topics in each issue, but we decided following meetings at the last DBE meeting in Brussels to concentrate each issue to covering a single topic in depth.

What depth of coverage is each issue expected to reach?

The MW is not intended to be primary research but an editorial on existing results. The time allocated to MW is constrained to approximately one week's effort per issue and reflects this strategy.

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First Issue - Focus on BML

Challenges in BML Issue

While the term "Business Modelling Language" is quite common, the specific meaning attached to it, or the role expected of it in the DBE project is unique. We found no similar contexts to its meaning in DBE in the secondary research we conducted and the literature[1] we investigated in preparing this edition. The term BML itself, though, is very common. No less than 21 other usages have been found, including at least 10 using ML as mark-up language (as expected with the advent of XML)[2].

As mentioned above, we found virtually no reference that provides a reasonably close match to the requirements of the DBE. This

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1 Documents sited on the www and standards bodies official publications.

2 For those with an interest, here is a list of the "BML" markup languages found with a simple google search (1) Beans markup language .(2) Better markup language (for server side scripting to a web browser!) (3) Broadcast markup language (4) Bibliography markup language (5) Binary markup language (6) Battlefield markup language (7) Blizzard markup language (8) Berylium markup language (9) Blinkenlights markup language (10) Baseball markup language.

has made building this first issue of Market Watch and selecting key documents as well as providing suitable editorial comment a difficult challenge!

What really stands us apart in DBE BML from BML as referenced in other documents is that the typical use of a business modelling language is to model business processes for the purposes of business process design[3]. BML languages are not typically designed to define business attributes for the purpose of business and software service discovery in an environment like the DBE[4].

Some of these languages are proprietary to particular software implementations, while others, such as UML, are open source languages.

These differences make it difficult to apply direct editorial comment to current literature on BML. What we have done for this issue, however, is to describe the current needs of the BML with reference to existing BML standards as they are currently described in literature. There are quite large differences in purpose, we think, to justify independent comment and you will find many of these throughout the paper.

For example, while no standard or publication provides us with the exact set of requirements for the DBE, we recognise the importance of service discovery as represented in the OASIS ebXML standard. It is important, because this standard both recognises and provides a means to implement the concept of service discovery, both in terms of software and business process alignment. The DBE project has so far shied away from addressing this issue.

We hope and expect that this MW edition will provide sufficient feedback to stimulate and advance discussion on the BML requirements that are already underway in the project. We think in this case that future updates on the BML will be useful, particularly as we open a dialogue with the IBM experts (and in negotiation, Sun Microsystems for the OASIS Universal Business Language) on the standards committees and as we as a project, begin to dialogue with those standards organisations.

What is BML?

BML stands for "Business Modelling Language". BML is neither a language like XML, nor a higher order language such as ebXML (with an underlying XML syntax). "BML" refers to any language that models a business in some way.

Interestingly, searching for "BML" in Google, hits returned with information about business modelling languages with a close match to the requirements of the DBE were predominantly papers written by members of the DBE consortium! This is proof we think of how far ahead the DBE thinking is on BML compared with other current research, technology and standards.

So what exactly is a BML? The answer to this question is a mixed bag, because a single and focussed definition does not exist. But two different uses of BML which we list below capture the meaning of the term.

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3 As either part of a business process reengineering, engineering or process design project or a large scale ERP implementation

4 Here the DBE has a specific ontological requirement not needed in most BML languages.




Business Process Modelling[5]

A modelling language to model business processes in order to:

- Understand the nature of the business systems
- Specify the business system as part of the requirements gathering stage for a software system supporting it.

This aspect of business modelling began with the Business Processes Reengineering fad of the 1990s but it has survived the BPR demise with the same techniques used in business process management and business process engineering.

> So what exactly is BML? The answer to this question is a mixed bag, because a single and focussed definition does not exist. But two different uses of BML capture the meaning of the term.

Business processes modelling languages are typically known as represented by discrete models based on a set of related diagrams. A number of different modelling languages have emerged for process modelling with a concomitant variation in taxonomies of primitives, but nearly all sharing the same semantics (they are all trying to model the same thing). The following languages are examples:

- The ARIS eEPC modelling language[6]
- IDEF3[7] originating in the US Airforce
- UML Activity, Sequence and State Diagrams, which is the most common used modelling language used today and supported by a large number of vendor tools (such as Rational Rose). While Activity Diagrams were originally designed to support complex algorithms in systems modelling, it has gained currency in the business modelling domain.[8]

A key characteristic of such modelling languages is that they can be represented in XML (although not all languages have a formally defined XML translation) but more importantly, such modelling languages can be subsumed into generic meta-models (or meta-meta models).

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5 Interesting sources are Audris Kalnins "Business Modelling, Languages and Tools" at melnais.mii.lu.lv/audris/BusMod3.pdf , and Audris Kalnins et el "The First Steps Toward Generic Modelling Tool" at melnais.mii.lu.lv/audris/EdDefLangFin.pdf Erik Perjons, "Enterprise Application Integration and Process Modelling", at www.dsv.su.se/~perjons/foi20030221.ppt and http://openebxml.sourceforge.net/information/papers/erik_perjons_process_20020901.doc for a summary of process languages.

6 See http://www2.hs-harz.de/~bthielert/ARIS6-to-be/m9a46c290-1741-11d6-7b72-8c98c3b4d03c.htm for an example.

7 See http://www.idef.com/idef3.html for a description of the IDEF3 language.

8 For an early (pre UML) reference on using object modelling for business process modelling by one of the founders of UML, see "The Object Advantage: Business Process Reengineering With Object Technology" by Ivar Jacobson, Maris Ericsson and Agneta Jacobson, Addison Wesley, 1994.

Why is this important? Audris Kalnins describes such generic approaches to modelling in section 4 of his paper. A tool built using this approach will not work until meta-models are loaded into it. And at that point, the software will work because all of the different meta-modelling approaches can be subsumed into a single meta-meta model. It is important to note in the context of DBE here that the modelling tool (software) itself is written to work at the meta-meta level, to interpret meta-models to enable users to build models. We are in danger in the DBE of not recognising the power of the meta-meta modelling approach, and build all[9] our software to link directly into the meta-models the constructed models[10].

It is also worth noting that many business modelling languages are proprietary or come from specific academic work. A good example is the work of Augusto et el at the department of electronics and computer science at the university of Southampton[11] and while these languages may have very fine architectures (based on Mathematical Logic and Set Theory, for example) they do not form the basis for internationally accepted standards.

But while these principles are of importance to the DBE, at least the initial implementations of the DBE will not be concerned with such detailed business processing models. The DBE project requires a business modelling language to represent the business organisation, its products and services, contractual basis and basic IT infrastructure[12]. We should look elsewhere for such languages, although it would be hoped that such languages were integrated within the UML meta-model and able to be represented in XML.

Modelling business service descriptions etc.

The majority of languages defined for business models focus on business processes and workflow. But in DBE, we need a less process oriented language to define business organisations, their products and services, contractual basis etc. In many ways, such a language seems closer to an Ontology language than a Business Modelling language; except that the BML is expected to describe a business organisation in the context of e-business transactions and to eventually support an increasing sophistication of process descriptions.

We've identified four main contexts of BML use for the DBE:

Firstly, the BML is seen as a repository of information for service discovery.

Secondly, it is used as a controlling mechanism during run-time[13].

Thirdly, it may be required at application software design time to realise links between the BML and other technical level details the software requires.

Fourthly, at run time, application software may need to access technical specifications (SDL, for example) linked via the BML. These are radically different requirements, some of which have not been finalised.

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9 I leave it as an open question whether there are valid uses of programming in the DBE directed directly to the model level

10 I would expect a good example of this is Microsoft Visio – the Visio tool itself can accept any number of meta-models which in turn can generate models (even code) but the actual tool "knows" nothing of the meta-models or models themselves.

11 See for example, "The Benefits of Rapid Modelling for E-Business System Development", Augusto et el at www.infj.ulst.ac.uk/~jcaug/ecomo2003.pdf

12 This last point is more controversial

13 An example given at the General Meeting in Brussels is an instruction to text message a boat service owner of trip requests made from the website by a potential customer.

One area in addition to these that has not been covered yet is the area of software service provision. The DBE is as much about software service discovery as it is about business service discovery. How do these relate and how they are then linked within the BML and SDL. The whole concept of service-oriented architectures needs to be integrated into the generic framework provided by the DBE – these are open questions.

> The DBE is as much about software service discovery as it is about business service discovery; how do these relate and how they are then linked within the BML anmd SDL.

BML for Service Discovery

In the first instance, a number of quite static information pieces will form the basis of service discovery. The following list outlines some of these data elements[14]:

- Company name and company legal information
- Location
- Industry description
- Products and services supplied including basic pricing information
- Products and services bought
- Relationships between services and service actors and services

[14] Although in the final detail, these elements will be much more complex, structured and will fall within a carefully defined syntax.

- Service aggregation information

But this is likely to be insufficient and a number of outstanding issues are unresolved. For example:

- Software services are frequently very generic, but need to be dynamically customised for different environments or industries. The BML must be sufficiently flexible or structured to provide software service configuration to provide users with the correct context and business logic. An example is a booking service.
- For many businesses, information pertaining to product (that could be of vital importance for someone initiating trade) descriptions will be too complex and large to be represented in the BML. For example, a corner grocery store wishing to setup in competition with a local superstore on home delivery would have to represent hundreds of thousands of product items. While the purpose of the BML is not to describe such products in detail, a rationale for product description must be defined. A more complex, but important question of how the service location facility will link to application software

[15] This is a good example of the power of the DBE, but it opens up many questions. For example, how will it be possible to allow ad-hoc aggregation opportunities and how will it support pre-defined aggregation agreements (which may have been made as a result of the service discovery mechanisms). The exact role of application software in the process is yet to be determined.

services and how they will, in turn, link to legacy data to provide users with more solid trading capabilities needs to be solved. In particular, these aspects may need to be expressed in the BML.

• Similarly to product descriptions, product pricing is frequently very complex, and if pricing is an important for service discovery, some way has to be found for a negotiation phase where prices can be contracted or at least standard pricing discount structures reviewed. The role of the application software in this is yet to be determined (i.e. is it a DBE task or a application software task, and if the latter, how is it to be realised).

As mentioned previously, typical languages used to describe business modelling do not cover the generically wide requirements of the DBE. Whatever languages we use, extensions will be required. But so far, the explanation of service discover seems more suitable for an ontology language than a BML language. The BML requirements described in the first list above could be easily represented in RDFS, but ontology languages are out of scope for the BML issue of the MW. But the two languages/standards we are considering.

Overview of Business Modelling Languages

The paper we are including in this section can be found in:

http://www.cs.kent.ac.uk/events/conf/2001/eebw/slides/sjcSlides.pdf

It is a presentation by an IBM'er on model driven approaches to large scale e-business systems development, and gives credence to the idea of a multi-layer meta-model. The paper does provide an external validation of the multi-layer approach that seems to be currently accepted within the DBE team and lends support for a serious examination of the OMG business modelling language that is very explicit in its meta-model layer requirements (adopting the model driven architecture approach).

What this means for the DBE, is that it is insufficient for the BML model to only contain sets of terms relating to various business domains. For example, if the BML were to merely contain a set of terms and relationships relating to retail food products, another set relating to hotels, hotel rooms, hotel facilities and another relating to electronic component specifications and so on, it would become difficult to provide generic application support for service discovery, and additionally difficult for application programs to function generically across sectors and industries. A simple example can be given of a booking system. A generic booking system could function for hotels, cinemas, theatres, doctor appointments and travel bookings. But each of these different sectors has different terminology and processing requirements. For example, purchasing 5 cinema or theatre tickets normally means 5 seats in a row, whereas 5 hotel rooms normally don't. Doctor appointments frequently have a link to a person (the doctor) date and time, whereas a hotel booking for a room with a arrival and departure date. A BML standard for the DBE needs to be able to represent these differences in such a way that the booking application program does not need to hard code "knowledge" about these differences.

The two main standards that come close to representing these abstract structures are the OASIS ebXML standard with its recently released Universal Business Language (UBL) and the OMG business modelling language, which is still in review stage.

Of the two, the OMG comes closest to the meta-model structure needed for the DBE, but the UBL provides models for a standard, but extensible set of business documents (order to invoice) and secondly, provision

for 13 (currently) code lists for data elements such as country, currency, payment means and so on. It also has a solid service discovery model (both at a business and technical level) that could be useful to the DBE.

In addition to these two abstract approaches to business modelling, a number of languages exist to represent specific industry, sector and functional areas of knowledge[16].

Most of these models do not need to contain the abstraction layers we require for the DBE. These domain specific standards will be important for the DBE as new areas of business and application domains are represented in it. But further work needs to be made to find appropriate standards for the hotel and tourist industry[17].

> The challenge for the DBE is to define our languages in such a way that they fit into the MOF, and there are a number of different ways of doing this. Do we take an existing M2 language or do we define our own M2 language in MOF?

OMG Business Model and MDA Architecture

The paper we are including in Market Watch for the OMG business modelling side, which is no longer available on the web, is available in the annex.

The DBE requires an abstract structure of models and this requirement has been given a definite solution by the OMG with their Model Driven Architecture (MDA).

The idea behind MDA is to enable a higher degree of automated application code generation based on models defined during the application analysis and design process. But there are many different modelling types required to specify application requirements and therefore, many different languages. These different languages need to be integrated though a hierarchy of modelling meta-models. The MDA standard has defined such a model structure that seems ideal for the purposes of the DBE.

The OMG has recently initiated the development of a new standard specifically to represent business modelling within the OMG MDA meta-model framework. Unfortunately this new standard is currently in review stage and it could be some time before a standard is delivered. But this situation does provide an opportunity for the DBE to engage in its formation, an idea that is currently being

16 For example, the UNSPSC product codes, eClass and UDEX, a standard initially for retail food item descriptions, but extending to other project groups (see http://www.worldwideretailexchange.org/cs/en/press_room/wr0767.htm and www.udex.com). In UNSPSC, for example, 10101505 is for "rats", which is within a live animal hierarchy. This is clearly M0 layer as described below.

17 Insufficient time was available for the production of this report, but an interim report will be produced by market watch giving more examples of these low level standards including standards for the hotel and tourist industry and any others associated with their opportunity space.

investigated within IBM. In the mean time, we are basing our analysis on this model by one of the responses to the OMG request for proposals (RFP). This paper exemplifies a clear illustration of how business models can be incorporated into the OMG meta-model structure described below.

From the presentation in http://www.cs.kent.ac.uk/events/conf/2001/eebw/slides/sjcSlides.pdf one can see four different modelling layers. The MOF is the top layer. It is a fixed language enabling the definition of meta-modelling languages. A meta-modelling language defined in MOF provides a language construct that enables automated programming code access into and across different meta-models. MOF is defined as M3, and the meta-modelling languages written with it is defined as M2. Business and systems analysts create models using a modelling language. The modelling language is the M2 meta-model and the models they create with it are called M1 level models. For example, a model that states that a hotel buys food from a food seller and in turn feeds its guests with the food purchased and then cooked/prepared would be an M1 model.

When hotel X implements a model that represents the fact that Hotel X buys food at Market Y, then this model is the bottom level, which is called M0.

The challenge for the DBE is to define our languages in such a way that they fit into the MOF, and there are a number of different ways of doing this. Do we take an existing M2 language or do we define our own M2 language in MOF?

The process for defining the OMG business modelling language has only begun, and initial responses have been received. The paper we have presented for the MW (attached above) represents one contribution to the request for proposals for that area of the OMG BML that is of importance to the DBE BML. The paper demonstrates how the different modelling levels can represent business entities and the relationships between them. For example at a high level, we want to model constructs, which will include processes, roles in processes, actors associated with the roles, organisations and people who are actors and so on. It is only at the M1 level, where concepts such as a particular process such as order and particular organisations such as customer, supplier and so on are represented. Using this approach, application software can parse a single place to collect sets of service descriptions, say, without having to know which ones exist is advance.

One interesting aspect of the model shown (but not described) in the papers is the fact that the different models are based on a common semantic ontology called the Business Semantics of Business Rules. This may be of use to the DBE project because it describes business vocabulary and rules. The RFP for the Business Semantics for Business Rules has recently closed and we are awaiting further information[18] regarding the content of responses. The Business Semantics for Business Rules forms the foundation for the whole OMG business modelling language, and should indicate the role of business vocabularies and rules within the DBE BML.

OASIS ebXML and Universal Business Language (UBL)

Papers we are linking to for this section of the MW are:

A journalistic introduction to UBL http://xml.coverpages.org/ni2004-04-30-b.html

18 Via the IBM network and in negotiation, Sun Microsystems.




UBL Specification at http://docs.oasis-open.org/ubl/cd-UBL-1.0/

UBL Presentation from Mark Crawford, the UBL chair of OASIS http://www.oasis-open.org/committees/download.php/4610/xml2003.pdf.

The other development of interest to the DBE is the OASIS ebXML standard. ebXML is a technology framework for enabling cross-enterprise e-business trading. The concept of modelling abstractions in ebXML is different to the OMG, but OASIS has also seen the need for a business modelling language. Their Universal Business Language (UBL) has just been approved by OASIS. There are two main elements in the UBL that should be of interest to the DBE project. Firstly, the UBL has standard, but extensible XML schemas for representing business transaction documents (Order to Invoice). Secondly, the standard provides 13 code lists for data elements such as Country, Currency, and Payment Means and so on. These code lists also conform to ISO standards where applicable. The challenge for the DBE is to fit these schemas into a structured meta-model framework (like the OMG). We have received positive feedback regarding the practicalities of the UBL standard[19], but in practice, many organisations are already committed to proprietary or other open-standard document format definitions, and will continue to do so for some time.

A primary goal of the UBL is to provide a standard cross-industry vocabulary which sits alongside and on top of the ebXML core components. However, UBL is seen by OASIS as a hub-format, which will enable interoperability across many other different standards. If adopted by framework platforms such as the DBE, schemas of various standards can be aligned to (in and out) the UBL definitions, saving considerable cross coding effort[20] [21] (see page 8 of the UBL presentation).

> The UBL (Universal Business Language) provides the DBE with standard and extensible document definitions that should be considered in the BML, especially as a solution to cross-document definition standards will become necessary.

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19 Telephone conversation with an old colleague, Guy Cuthbert who is an e-business expert in the domain of metadata and information exchange. www.abs-ltd.com . ABS has gone further than any other organization I know in developing a working DBE type environment, but using .NET.

20 10 different standards would require 90 different cross-code mappings (if all combinations were necessary) whereas the hub model, would require only 20.

21 Mark Crawford, the UBL Chair, considers this hub model the only available option – there being "no practical alternative to this plan".

While it is unlikely that these definitions will provide the goal expected[22] the UBL does provide the DBE with standard and extensible document definitions that should be considered in the BML[23], especially as an elegant solution to cross document definition standards will become necessary.

We consider the ebXML route to be still an open-option. It is more mature than the OMG standard and while it does not have the same degree of meta-modelling infrastructure, the context drivers within ebXML are similar to those proposed at the M2 layer within the OMG business model[24] and may be regarded as suitable as a starting point for the DBE BML.

One final point regarding the relationship between UBL and ebXML: Service discovery in the ebXML standard is based on matching business process definitions. The BP definitions in ebXML do not describe the internal processes in detail, but provide sufficient external detail to determine if partners are able to agree on transaction requirements (e.g. order confirmation from buyer required prior to order being moved into production, buyer pays insurance etc.). It also provides the basis for document element and aggregation definitions required by each party. So far, we have not seen any discussion on these issues within the DBE community, but this issue is important to enable software suppliers to write truly interoperable software. The DBE is also taking the step forward to software based service oriented architecture. So the problem of service description defined in ebXML goes one step further in DBE to software service description. But given that software can typically cross industry boarders, the linkage of business service requests to software service execution is extremely important but problematic in the DBE. Our opinion is that this aspect of service delivery sits between the current ideas of the BML and the SDL. More effort is required in addressing these issues in order to make a sound commitment to a way forward.

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22 Experience at ABS has suggested that complexities in practice not reflected in the UBL has made the goal only partially achievable. Examples are complex invoicing/delivery coordination, multiple documents that only partially match (e.g. one order, three deliveries and 5 invoices) complex product definitions and pricing, which are all very common in practice. One aspect the UBL is having for companies like ABS, is a tool to attempt to drive customers to more standardisation. Some partial success has been had there.

23 Although the level of document definition has not been addressed by the BML group, Somehow it appears as though document definitions lay somewhere between the BML and the SDL in a service oriented architecture.

24 See, for example, "The Universal Business Language" US Government XML Working Group, Washington, D.C., 20th February 2002, available at The working group describe ebXML context drivers as Business Process, Industry Classification, Product Classification, Geopolitical Region, Official Constraints, Primary Business Role (vendor, customer etc), Supporting Business Role (shipper, insurer etc.) and system capabilities. These core context drivers are all applicable to the DBE environment and are currently addressed in the ebXML and UBL standards.

Annex

Architecture of Business Modeling
Stan Hendryx, Hendryx & Associates
November 14, 2003

The roadmap for developing business rules specifications of the Object Management Group's Business Rules Special Interest Group has five RFPs, one of which is the Business Modeling RFP1. The goal of this writing is to frame and structure the subject of business modeling to support a decision in the OMG about factoring the Business Modeling RFP into several RFPs. Following a series of presentations and discussions about business modeling in the summer of 2003, a joint meeting of the Business Rules Special Interest Group and the Business Enterprise

Integration Domain Task Force adopted this working definition of a business model:

> **business model** collection of related architectures or blueprints of, by, and for business people, aimed toward capturing (i.e., describing and/or prescribing) the essential workings of the business (not IT capabilities per se) from a purely business perspective. A business model provides comprehensive answers to the six basic interrogatives: What? How? Where? Who? When? Why? In doing so, the business people intend to provide a sufficient understanding of the business that may be used in a variety of ways to solve business problems as perceived by business people, one of which is providing business requirements for information systems.[1]

Business processes are a prominent, recurring theme in business modeling. The BR SIG and BEIDTF joint meeting adopted this working definition of a business process:

business process category of **business model** that focuses on the transformative aspect of the business – that is, value chains or sequences of functions that take raw materials or other resources and transform them in such a way to add value for people inside and/or outside the business.[2]

Scope and Objectives of the Business Modeling RFPs

The Business Modeling RFP(s) will request a metamodel for modeling any kind of human work activity, in any domain, in language familiar to domain experts. The perspective of the business models contemplated by the Business Modeling RFP(s) is that of the business owner or planner.

While projects to create these business models are likely to be motivated by a desire to specify, design and build information systems to support the business, the business models contemplated focus on the business

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[1] The five Business Rules RFPs are: Business Semantics of Business Rules, br/03-06-03, issued June 2003; Production Rule

Representation, bei/03-09-03, issued September 2003; Business Modeling, discussion underway; Business Rules

Management, start 2004; Business Rules for Legacy Transformation, start 2004.

[2] Joint BR SIG/ BEIDTF meeting, Boston, Massachusetts, September 9, 2003.

itself, rather than the information system. In focusing on the concerns of business owners and planners, the business models contemplated are independent of implementation considerations, record-keeping systems (automated or manual), or technologies that might be used. Limiting the scope of the business models in this way has the dual advantages of simplifying the modeling process and preserving the ability to use the resultant models with alternative implementation approaches and technologies, as with the OMG's Model Driven Architecture™ (MDA). Business models may describe parts of the business and rules that are not related to an information system as well as those that are. There are uses of business models that transcend system development.

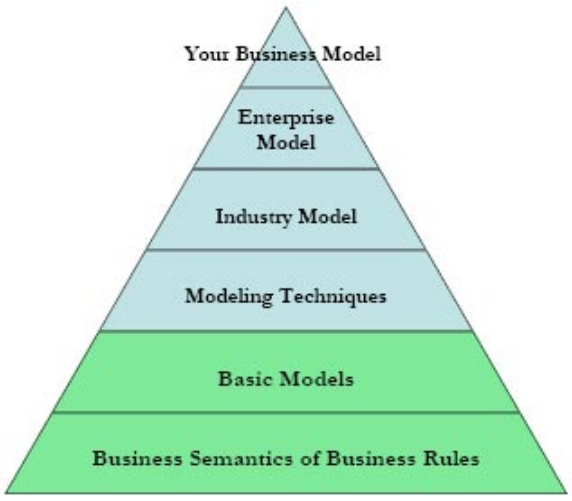
A key objective of OMG Business Modeling is to help bridge the gap between business and IT, to support model driven system development. While the business models contemplated are expressed in language familiar to domain experts – "business people" – they are also rigorously mapped to formal logics and are constructed on the OMG's Meta Object Facility™ (MOF) technology. This combination of natural language expression, formal logic, and MOF allows business people to express their domain in their own language and it allows IT professionals to use software programs to interchange, interpret and process the expressions. As such, these business models can effectively serve as Computation Independent Models (CIM) in the MDA.

In recent meetings of the OMG's Business Enterprise Integration Task Force several different approaches to business modeling were presented. A goal of the Business Modeling Metamodel is to support with generic building-block capabilities approaches similar to these as well as other approaches. To this end, it is the objective of the Business Modeling RFP(s) to support definition and reuse of specialized vocabularies and modeling techniques at many levels. Widely applicable generic modeling techniques need to be defined and then specialized to different industries or applications. Individual companies and even different groups within a company need to be able to tailor these vocabularies and techniques to their own needs. This will require means to import and reuse vocabularies and the ability for users to define their own meta-languages based on familiar terminology of their domain, retaining a basic linguistic and logical model underneath.

Overall Structure of the Business Modeling Metamodel

To achieve the desired generality and flexibility, a layered approach is taken the Business Modeling Metamodel (BMM). Packages that are relatively independent of one another can together provide the needed range of expressivity and flexibility. These independent packages are termed "basic models" in this paper. Generic capabilities will provide common semantics and promote model interchange and tool interoperability across business modeling techniques.

The pyramid below illustrates the layered approach. The bottom two layers, shown in






green, represent the Business Semantics of Business Rules (BSBR) metamodel now being developed and the proposed OMG Business Modeling Metamodel, called Basic Models. The upper layers could be provided by vendors of modeling techniques, industry groups, or company-wide semantic integration initiatives. The Your Business Model layer at the top represents a particular model for a particular project or purpose, which leverages the other layers.

A particular decomposition has been done for the sake of discussion, and is shown in the UML structure charts at the end of this paper. The remainder of this paper discusses the overall plan of the decomposition and each basic package.

At the bottom is the foundational Business Semantics of Business Rules (BSBR) package with its Business Vocabulary and Business Rules sub-packages. The BSBR contains the linguistic and logical foundation for all of the other packages. The Business Vocabulary provides the linguistic capabilities for business modeling, fully mapped to formal logic. The Business Rules package adds the capability to formularize logical expressions in natural language using terms contained in the Vocabulary. The other packages define standard terms, facts and rules about the basic subject, specialize BSBR meta-concepts, or extend the BSBR metamodel with additional meta-concepts.

The Basic Models Package

Developing the Basic Models package shown above and in the center of the first diagram at the end of this paper is the objective of the Business Modeling RFP(s). The Basic Models package contains seven sub-packages. Six of the sub-packages in Basic Models each correspond to a basic model. Each of these packages is presumed to contain a metamodel adequate to model the basic model subject generally. The six basic models – Business Domain, Business Process, Location, Business Organization, Event, and Business Motivation – address the six interrogatives and are thought to be sufficient to support virtually any business modeling need[3]. Metamodels describing standard associations between the six basic models is contained in the Constructs package. The seven static structure diagrams given at the end of this paper of the Basic Models sub-packages are only suggestive. They are notional UML diagrams intended to illustrate the types of concepts and relationships supposed to be contained in each basic model. The normative requirements and contents of each basic model will be defined in the Business Modeling RFP(s) and submissions. They will ultimately be defined in terms of the BSBR metamodel, not UML.

Different vendor modeling techniques can each be specified in their own package, represented generically by the package named A Business Modeling Technique. Any number of technique packages can be defined. The set of OMG standard modeling capabilities represented in the Basic Models package will make developing new techniques easier and with a greater level of interoperability due to their common use of

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[3] The assumption about the sufficiency of these six basic packages is based on the Zachman Framework for Enterprise Architecture. See www.zifa.com. This sufficiency is not formally proved, but is based on Zachman's heuristics.

the Basic Models and BSBR, which is, in turn, built on MOF.

interoperability due to their common use of the Basic Models and BSBR, which is, in turn, built on MOF.

The Business Rule Management package contains the metamodel for managing the vocabulary as a whole, and sets of vocabularies, and (potentially large) collections of business rules, including versioning, responsibility, effectivity, and traceability. The Model Management package contains the metamodel for managing versions and collections of business models or rules.

Fortunately, there is existing work involving most of the basic models that can be drawn upon to assemble the complete array of basic model packages in a practical timeframe. The BSBR RFP has been issued, and initial responses are due in January 2004. Much relevant work on business processes is contained in the OASIS Business Process Execution Language (BPEL), and the OMG Business Process Definition Metamodel. A goal of OMG Business Modeling is to make the Business Process package suitable as the specification for BPEL Abstract, as well as for the Business Process abstractions of OMG Business Modeling. The UML has action semantics.

Work is underway in the OMG to revive the Business Organization Structure work, and this work could inform the design of the Business Organization package. Several models of time are available for the Time package in Event. The Location package can draw upon existing work in 2D and 3D spatial and geographic modeling, and on modeling postal addresses. The Business Rules Group has done important work on a Business Motivation model. The BRG and others have done good work on the subject of Rule Management that can be adapted. The MOF Facility work can be helpful for Model Management. A generic Business Domain metamodel can be built that can be tailored to the needs to different business domains, to provide domain-standard vocabularies and rules for modeling different businesses with inter-domain compatibility to help standardize customer, supplier, and partner interactions in the domain.

Constructs

The Constructs package provides a metamodel of generally useful standard linkages between the six basic models, together with their rules. These linkages might be included: (process initiation, event), (process completion, event), (activity, role), (process, input), (process, output), (policy, event), (policy, state), (policy, role), (state, event, activity), (activity, place, time), and others. A few of the many possibilities are shown on the Constructs diagram, to illustrate the approach.

Business Semantics of Business Rules

The BSBR is the foundation for business modeling. BSBR provides a general linguistic metamodel that is mapped to formal logics, especially first order predicate logic, modal logic, basic arithmetic, and set theory. The BSBR metamodel has two parts: a Vocabulary metamodel and a Business Rules metamodel. The BSBR metamodel is mapped to MOF for model interchange. The BSBR RFP can be found on the OMG Web site at www.omg.org/cgi-bin/doc?br/03-06-03.

Business Vocabulary

The Business Vocabulary metamodel provides a means for users to define a vocabulary for their purposes, capturing the terms and facts that describe the subject matter of the vocabulary. The Business Vocabulary metamodel defines concepts, each of which can have lexical symbols (terms) in different natural languages that can be used by




different speakers to refer to the concepts. The concept of a semantic community is included, being defined by a set of concepts understood and shared by members of the semantic community. The concept of a speech community is included, wherein speakers share a language and set of symbols with which to communicate shared concepts. This powerful metamodel provides support for a very wide range of multi-lingual modeling and model translation.

The linguistic constructs permitted by the BSBR Vocabulary metamodel are mapped by BSBR to formal logics. The range of logics supported admits a very wide range of logical capability with sufficient syntactic "sugar" to enable users to define a rich, natural-sounding vocabulary for any domain in any natural language. The BSBR metamodel is represented as a MOF model, enabling interchange of BSBR models using XMI and storage of BSBR models in MOF repositories. The logical underpinnings of the BSBR language make it possible to perform inference and logical transformations in accordance with the principles of Model Driven Architecture, to derive from the business models consistent structural components for information system designs.. These characteristics make the BSBR a potent tool for MDA. Building the Business Modeling metamodel on top of BSBR will multiply its potency.

The packages that depend on BSBR can use it in several ways to build their basic model. The vocabulary of the basic model can be defined using BSBR Vocabulary capabilities. Categorization types can be defined in the basic model to define a basic metamodel using the Vocabulary capabilities. Or BSBR meta-objects can be specialized to the needs of a basic model. Finally, the BSBR metamodel itself can be extended to include other meta-object types.

Business Rules

The BSBR Business Rules metamodel enables users to write logical expressions involving the terms and facts of a Vocabulary. These expressions incorporate quantifiers, logical operators, and performatives to denote constraints and derivations between Vocabulary elements. Sets, bags, and modal logic are available for business rule constructs. As in the Vocabulary, the linkage between linguistics and logic in the Business Rules provides for natural sounding yet formally rigorous rules to be expressed.

Business Domain

The Business Domain represents the static schema of a particular domain. The Business Domain package is a place holder for a standard vocabulary and related rules of the domain, in the language of the domain. In each business modeling application, a Business Domain package appropriate for the project would be provided or developed as part of the project. The Business Domain package needs to provide a generic definition of state that can be used by modeling techniques that need state information.

A generic Business Domain package could be developed, specifying types for general business usage, as illustrated very schematically in the Business Domain package diagram. Use of the generic Business Domain package would provide a degree of standardization between domains based on the package that would promote inter-domain compatibility and interoperability.

Standardized Business Domain packages could be developed by and for a particular industry that wishes to standardize their business nomenclature and promote collaboration within the industry and its business partners. A Business Domain could be a very technical kind of business, such as the business of specifying software architecture, or designing networks, in which case the Business Domain might contain a standard structural metamodel for specifying a software architecture or network design. It is expected that organizations representing different domains will provide the Business Domain package for their domain, not necessarily through the OMG process. Interested members of the OMG Domain Technical Committee may wish to organize to develop special Business Domain packages for their purposes, which could become adopted OMG specifications.

The capability of BSBR to import one vocabulary into another and to define different vocabularies for shared concepts in the same or different languages provides powerful mechanisms for projects to build their vocabulary from vocabularies used by their industry, their regulators, or other departments or sites within their own company.

Business Process

The Business Process package contains the metamodel for describing processes. Processes are described in terms of input, activity, output, including process precedence and rules governing process branching, looping, and synchronization. Times, places, or who or what performs the activities of the process are not included at this level (these connections are made in the Constructs package). The Business Process package incorporates action semantics to support a declarative logical specification of business processing activities, independent of how or by whom the actions are actually performed. What causes the initiation of a process is not covered in the Business Process package, but rather the connection between business processes and events is defined in the Constructs package, possibly based on event-condition-action rules supported by the Event package.

Location

The Location package contains the metamodel for describing geographic locations, business sites, geographic areas, volumes, and perimeters, political subdivisions and boundaries, and logical connections between them. The connections signify logistics paths for communication between sites, whether by post, voice or data network, or transport carrier, including business (not technical) requirements or assumptions for such paths. A two dimensional geospatial model is needed, and, for some applications, three dimensional. A metamodel for world postal addresses is needed. The Location package adds spatial logic and reasoning capability to models.

Business Organization

The Business Organization package contains the metamodel for describing organizational units, the relationships between them, the roles performed by each unit. Persons may possibly be modeled here as a type of organizational unit. Hierarchy, partnerships, and federations are part of the model. The Business Organization metamodel also needs to allow users to describe lines of authority in organizations and approval chains, including alternate approval paths.

Event

The Event package contains the metamodel of time, including calendars, clocks, timers, time periods and time intervals, and relationships between them. The Time package adds temporal logic capability to models. Event also contains the metamodel of business events, including rules about their temporal ordering or partial ordering in the business activity cycle, and support for de-




fining event-condition-action rules.

Business Motivation

The Business Motivation package contains the metamodel for describing business ends and means, goals, objectives, strategies, tactics, plans, policies, laws, regulations and related elements, and rules that govern the relationships.[4]

Model Management

The Model Management package contains the metamodel for dealing with models as a whole, including model versions, change management, storing, retrieving, merging, splitting, and interchanging models. The configuration management elements of Model Management are reused by the Business Rule Management package.

Business Rule Management

The Business Rule Management package needs to contain the metamodel for managing collections of vocabulary elements and rules. Management issues that need to be addressed include versioning, effectivity, traceability, responsibility and change authorization, classification and indexing for effective retrieval of large vocabularies and rule bases, verification and validation of vocabulary entries and rules for consistency and conflict.

The Business Rule Management RFP is a separate RFP on the BR SIG Roadmap.

Summary and Conclusion

This paper has presented the Business Modeling metamodel as an integrated whole, decomposed into several more-or-less independent packages for discussion. How we go about building it through the OMG technology adoption process is a matter for discussion by the BR SIG and the BEIDTF. The functionality of the packages presented in this paper might be developed under separate RFPs, or combined into fewer, larger RFPs. The BSBR RFP is in progress. What other RFPs to issue remains an open question, hopefully to be resolved by the end of 2003 so work can proceed. There is also the matter of sequencing of the RFPs, which do to in parallel and which to do serially. Particular vendors may wish to develop sub-packages of the Business Modeling package that support their approach and promote interoperability of their tools; these will depend on the basic model packages, so would need to be done later. The trade off is that with more RFPs, each individual RFP is easier to manage, but RFPs tend to take on a life of their own, and the outcome of having them well integrated and coordinated is more uncertain. Identifying all the packages and defining their boundaries and interfaces will help get several RFPs through the OMG process with their collective integrity intact. With fewer, larger RFPs, or one very large one, a well-integrated result may be more certain of attainment, but the work would need to be very carefully managed and facilitated. The overall time required for the whole roadmap is also a consideration. What difference would different approaches make? Some middle ground will likely be the best choice, with fewer than nine RFPs for the remainder of the work (beyond BSBR), but more than one.

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[4] The Business Motivation package diagram is adapted from the Standard Model for Business Rule Motivation developed by the Business Rules Group.

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