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Technology in the context of e-Business

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Summary

The goal of UN/CEFACT's Business Collaboration Framework (BCF) is to provide businesses with a solution to define their external information interchanges and related business activities (business collaborations) independent of the underlying implementation and infrastructure technology. Because the BCF is not dependent on any specific implementation technology, it protects the investment of Business Collaboration Model development against future changes in the underlying infrastructure. This paper provides the history behind and brief outline of the BCF and its relationship to other related concepts.

Introduction

The success and failure of technology specific e-Business Solutions

Over 25 years ago the idea was born to eliminate the use of paper documents for exchanging business data by linking computer systems together so that the data, normally on paper, could be sent from one system to the other. This concept became known as EDI, Electronic Data Interchange. The advantages are still valid today, no re-entering of data and therefore fewer errors, if any. No dependency on postal services, cost savings per transaction from $75.00 to 50 cents, to mention just a few. However, looking at the statistics of who are currently utilizing EDI, one must wonder why it is not used by every business. Of the top 10,000 companies on the global scale (Fortune 1000 in the top 10 countries), almost everyone is using EDI, 98% to be exact. However, for the rest of the world only 5% are EDI users. In other words, millions of companies are still using faxes and paper documents. Why?

The answer is well known; start up cost. EDI saves a lot of money, over time. However, before that happens, companies must spend resources up front to identify their data requirements in order to map their in-house data to the EDI messages. This process is required for each new trading partner implementation, and for each EDI message with that partner. Thus, a very costly effort that only the Fortune 1000 companies in each country can afford.

In order to reduce the cost so that the implementation becomes transparent, one would have to agree to a single data requirement for a particular EDI message. This would allow software vendors to create an EDI application that would have a large enough market to reduce the cost for small and medium sized companies to be able to afford. This will never happen. So what would it take for software companies to build software that is not tailored for each of the different EDI message implementations but will be able to adopt to the different data requirements for a particular customer and their trading partners?

The success of any new way to exchange data among businesses depends not only on the adoption by the Fortune 1000 companies of standard agreements, but on their adoption by the rest of business through out the world, the other 25,000,000. In order for business of any size, anywhere, to benefit from the next generation of e-Business standards, those standards must contain all the information to allow software developers to create programs that can be purchased off-the-self (shrink-wrap-solutions). The question that now arises is, will the software industry deliver such "cheap" off-the-shelf shrink-wrapped solution?

In search for a technology-neutral e-Business Solution

Before describing UN/CEFACT's technology-neutral e-Business Solution and its place in the new world it is worthwhile to understand the history behind the work, the thoughts and ideas that served as the guiding light in forming the goal to define the next generation of electronic business information exchange without prior agreements and able to withstand the change of the underlying technologies. A goal that addresses not only large corporations wishes, but also small and medium sized enterprises. This section is an account of the work that led to the creation of the Business Collaboration Framework.

Locking at new ways

In the late 1980's ISO/IEC/JTC1 created a special working group to research the idea of exchanging electronic data amongst organizations without prior agreement. This effort became known as "Open-edi". UN/ECE/WP.4 (predecessor to UN/CEFACT) participated in this work from the start in 1990 when the recommendation from the special working group was adopted by JTC1 to create a reference model. The Reference Model became an International Standard in 1997. However, the principal concept of that work was embraced by WP.4 long before in its efforts towards the "Next Generation" of EDI.

In 1995 UN/ECE/WP.4 created an ad-hoc committee (AC.1) to investigate the available technologies for creating the "Next Generation" for electronic information exchanges among business trading partners.

AC.1 reported that the most promising technology addressing the shortcomings of EDI was that of Business Process and Information Modeling (BPIM). By utilizing BPIM, standards would not have the

problem of ambiguity; instead they would describe the complete processes and their information requirements, including constraints, options in execution, exceptions, etc. Further, AC.1 recommended that object technology should be used since it was not only the emerging star, but offered many, if not all, aspects required to describe the real world, which is made up of objects. In addition to identifying BPIM and Object Oriented Technology (OOT), AC.1 identified the failure of getting the SMEs to adopt (use) the current EDI standards.

AC.1 recognized that even with BPIM, the issue of businesses doing things differently would not go away, even if it is only in regard to external processes. AC.1 proposed that the next generation standards would be BPIMs for a particular business goal, such as "Catalog Ordering," that contained "all" the possible activities that could be part of that goal. In other words, the approved BPIM would be a super-model for a given business process. Since such models would have many ways of execution (paths through the model) each path would be identified as a scenario. Depending on their internal processes, one trading partner may be able to execute all the scenarios of a model, where another may only execute a certain number of them. For two trading partners to engage in the same business process, they must both be able to execute at least one scenario in common. In regard to the SMEs, it is envisioned that the software providers would create applications that implement BPIMs with their most popular scenarios.

During AC.1's research, one other path was explored, that of utilizing "intelligent agent" (IA) technology. Instead of "documenting" business interaction in BPIM, why not "discover" the capabilities of potential trading partners in order to determine if the internal processes would support interactions? AC.1 did not dismiss that possibility but concluded that the sole use of IA technology would currently be a costly effort only affordable to the "Fortune 1000" instead of the SMEs.

As WP.4 transitioned itself to the new organization, now known as UN/CEFACT, AC.1's BPIM recommendation became the foundation for the new work ahead. UN/CEFACT created the Techniques and Methodologies Working Group (TMWG) in order to continue the work of AC.1. Based on the original recommendation, UN/CEFACT also created the Business Process Analysis Working Group and encouraged UN/EDIFACT and other working groups to move towards adopting BPIM for its EDI standardization.

The TMWG continued by evaluating available modeling techniques started by AC.1. In 1998, the TMWG recommended that UML should be the modeling technique of choice for UN/CEFACT. This recommendation was adopted by UN/CEFACT. In order for UN/CEFACT as an organization to not only adopt UML for BPIM, but also to ensure that its use was consistent for all UN/CEFACT working groups, enabling them to share their resources, TMWG was asked to develop a methodology. An effort to specify the UN/CEFACT Modeling Methodology (UMM) was started in 1999 by the TMWG. The work is based on the Rational Rose Unified Process. Since the start of the work, members of UN/CEFACT and/or TMWG, such as SWIFT, TM Forum and RosettaNet have not only participated in the work but also adopted it in part or expanded it.

Before providing the last events that let to the creation of the BCF a short description of the new technologies that were identified by TMWG (AC.1) to be utilized, will aid understanding of the new direction.

Open-edi

Open-edi is an ISO/IEC vision of future EDI. ISO/IEC 14662 provides a baseline for all levels of standards that are needed for the specification of Open-edi scenarios and their implementation. TMWG has explored and recommended various modeling techniques including UML for business modeling and information modeling.

Open-edi takes a generic approach. It enables organizations to establish short-term relationships quickly and cost effectively. Open-edi provides the opportunity to lower significantly the barriers to electronic data exchange by introducing standard business scenarios and the necessary services to support them. In principle, once a business scenario is agreed upon, and implementations conform to the Open-edi standards, there is no need for prior agreement among trading partners, other than the decision to engage in the Open-edi transaction in compliance with the business scenario.

The field of application of Open-edi is the electronic processing of business transactions among autonomous multiple organizations within and across sectors (e.g., public, private, industrial, geographic). It includes business transactions that involve multiple data types such as numbers, characters, images and sound. The Open-edi Reference Model provides the standards required for the inter-working of organizations, through interconnected information technology systems, and is independent of specific information technology (IT) implementations, business content or conventions, business activities and organizations.

The Open-edi Reference Model places existing EDI standards in perspective using two views to describe the relevant aspects of business transactions:

- the Business Operational View (BOV) and;
- the Functional Service View (FSV).

The BOV addresses the aspects of a) the semantics of business data in business transactions and associated data interchanges, and b) the rules for business transactions which apply to the business needs of Open-edi, including:

- operational conventions,
- agreements,
- mutual obligations.

The FSV addresses the supporting services meeting the mechanistic needs of Open-edi. It focuses on the Information Technology aspects of functional capabilities, service interfaces, and protocols, including:

- capability of initiating, operating and tracking the progress of Open-edi transactions,
- user application interface,
- transfer infrastructure interface,
- security mechanism handling,
- protocols for inter working of information technology systems of different organizations,
- translation mechanisms.

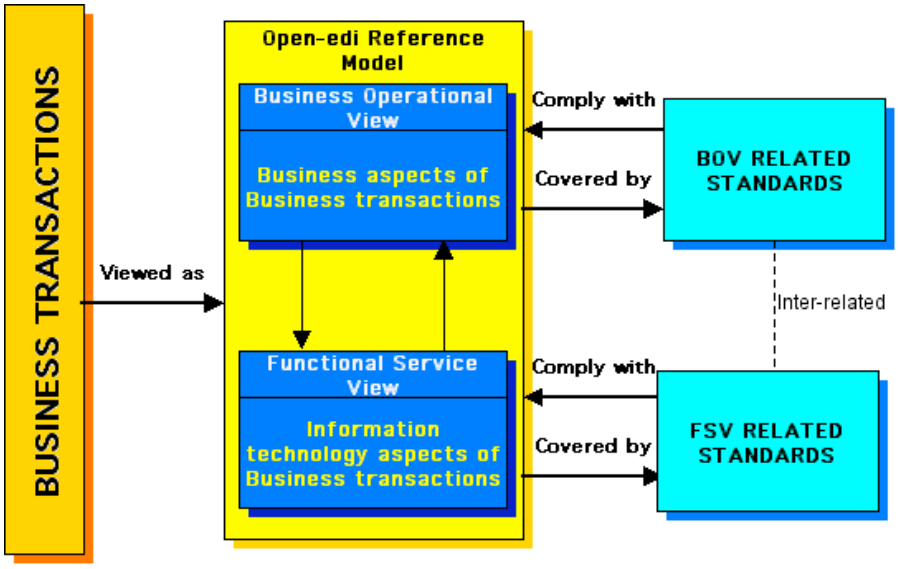

Figure 1 - Open-edi environment

Figure 1 sets out the relationship between the Open-edi reference model and these views. While the Model itself is developed as a standard, other standards are required. Standards are driven by, and must satisfy, the requirements identified within the Open-edi Reference Model.

Although TMWG's work must satisfy the overall requirements of the Model, the primary focus shall reside with the BOV and shall be independent of the supporting FSV solution. TMWG's assumption is that the FSV will be developed by commercial software vendors which enable distributed object computing environments, and ensure backward compatibility to traditional EDI messages. As such, the resultant BOV related standards will provide the business and object class models to construct Open-edi scenarios.

Interoperation among application programs requires that there be "common ground" in their exchange of information, so that there can be common understanding and agreement on the information being jointly processed. Common ground in this exchange of information is accomplished in current EDI methodology through a neutral, application independent syntax, i.e., typically for business data a translated UN/EDIFACT interchange file. All consideration of application programs, how to facilitate their interoperation, functionality variations, and the business practices behind them are deliberately ignored. Instead, the current EDI standardization process in UN/EDIFACT concentrates solely on the structure and content of the translated interchange file. The problems associated with UN/EDIFACT standards and the standard development process, are well documented and are not repeated here.

However, it is essential to understand that for Open-edi to overcome the current impediments to implementing EDI, a new paradigm must be envisioned that shifts the focus on EDI standards from the interchange file to the information contained in the business processes. While business practices from one business organization to another are highly variable, depending on competitive strategies, experience and management style, activities can be decomposed into business processes that are more generic to the type of business. This analysis through the modeling process will identify object classes and models that are likely candidates for standardization. TMWG looks for standard reusable components from which to construct information exchange software. Such a goal is a core concept of object technology.

Object Oriented Technology

Object Oriented Technology (OOT) is one of the most talked about concepts of recent years. It all comes down to organizing things in ways that echo how things are put together and relate in the real world.

Consider the children's toy, Lego®, small plastic building blocks in various colors and sizes. They have small round pegs on one side that fit into small round holes on other Lego® pieces so that they fit together snugly to create larger shapes. With different Lego® pieces (Lego® wheels, Lego® engines, Lego® hinges, and Lego® pulleys), it is possible to build castles, trailer tractors, giant robots that swallow cities, or just about anything else you can imagine. Each Lego® piece is a small object that fits together with other small objects in predefined ways to create other larger objects. In turn, these fit together and form even larger objects. For example, a tractor and trailer will fit together to form a wagon.

As a second example suppose it is possible to walk into a computer store and, with a little background and some help, assemble an entire personal computer system from various components: a motherboard, a CPU chip, a video card, a hard disk, a keyboard, and so on. Ideally, when all the various self-contained units have been assembled, the result is a system in which all of its units work together to create a larger system that can solve the computational problems for which it was designed.

Internally, each of those components may be vastly complicated and engineered by different companies with different methods of design. But it is not important to know how the component works, what every chip on the board does, or how, when you press the A key, an "A" gets sent to the computer. As the assembler of the overall system, each component you use is a self-contained unit. The main interest is how the units interact with each other. Will this video card fit into the slots on the motherboard, will this monitor work with this video card, will each particular component convey the right commands to the other components it interacts with so that each part of the computer is understood by every other part, etc.? Once it is known what the interactions are between the

components and one can match the various component's interactions, putting together the overall system is easy.

OOT works in exactly this same way. Using OOT, the overall design (model) is made up of many different self-contained components (objects), each of which has a specific role in the model and all of which can talk to each other in predefined ways.

Modeling

As TMWG identified the necessity to decompose business processes to their more generic components, it also concluded that a consistent methodology (modeling techniques) for conducting the analysis and design must be utilized. Thus, it is important to explore the benefits of using modeling techniques to identify the data requirements and data flows of a particular business process. These models assist in providing an interface specification that enables non-standard data, internal to a business process, to be mapped and translated to a representation of standardized data.

These models, which provide the interface specification, will constitute the new Electronic Business (e-Business) standards, once they are certified as satisfying the business requirements. These new standards will be independent of the interchange data syntax, transport infrastructure, and server software.

UN/CEFACT's e-Business Vision

UN/CEFAFT's vision for e-Business is to develop a "framework" that utilizes Business Process and Information Modeling, UML and UN/CEFACT's Modeling Methodology (UMM) in such a way that any industry group or standards body, including UN/CEFACT, can create models that identify every possible activity to achieve a specific business goal. These models will be registered and stored in a global "virtual" repository. Users (trading partners - TP) will register "their" particular path/paths through the model (scenario(s)) so that others who want to engage with that TP can determine if they share at least one scenario. To ensure that the models not only follow the UMM but also are interoperable, the models will use reusable and most common objects (Common Business Objects/Business Entities) that will be used by the modelers as they document a particular business process. *However, the messaging format, packaging and routing and the meta-model for the repository are not defined by UN/CEFACT but by the underlying implementation technology.*

A special note in regard to the view that there is no need to create and register models and scenarios but instead discover trading partner capabilities via intelligent agent technology. It is true that over the past few years this goal is achievable, but it still will require resources only available to the Fortune 1000 companies. The main goal for UN/CEFACT to create a Framework that would allow SMEs to engage in e-Business via shrink-wrapped solutions. Yes, over time "intelligent agent" technology will become more affordable. Further, the BCF is extendable. Even now, TPs must register their capabilities in a global repository. The first use of IA technology should be to search the repository in order to identify who has the same capabilities in order to do business together. The next step would be to expand the use of IA by "adopting" internal processes to external scenarios that are almost "usable". And finally, one can expand IA technology by utilizing "internal" Business Collaboration Models (BCM) in order to engage in an automated "knowledge" exchange of a TP system, that also uses IA and BCM, to identify, negotiate and agree to do business in a mutual way. But that is still some years away. BCF started the process in a way UN/CEFACT envisioned it, not only for the "big" guys, but also for the "small".

UN/CEFACT's primary objective in finding the solution to the above problems was to focus on a new e-Business standards that would make e-Business technology widely available, non-obtrusive to the business process, and cost effective for all organizations of any size, anywhere. The requirements to make this objective a reality included:

- Production of well-defined, consistent standards for interoperability, i.e., reduces the number of ways of doing things;
- Utilization of off-the-shelf tools that are available for analysis and implementation;
- Separation of analysis from application design and programming;

- Availability of training and reference sources (i.e., take advantage of a mainstream methodology for new projects in industry);
- Provision for automatic generation of e-Business interactions; and
- Separation of data definition and format from the transport layer.

In looking towards the next generation of e-Business standards, it became clear that the best solution would be to separate the "how" from "what". Or more to the point, that Business Process and Information models would defining the "what" independent of the transport mechanism, the "how". This way, the same models can be used to move the information using EDI messages, distributed object technology or whatever new technology may surface, such as today's Web Services (Figure 2).

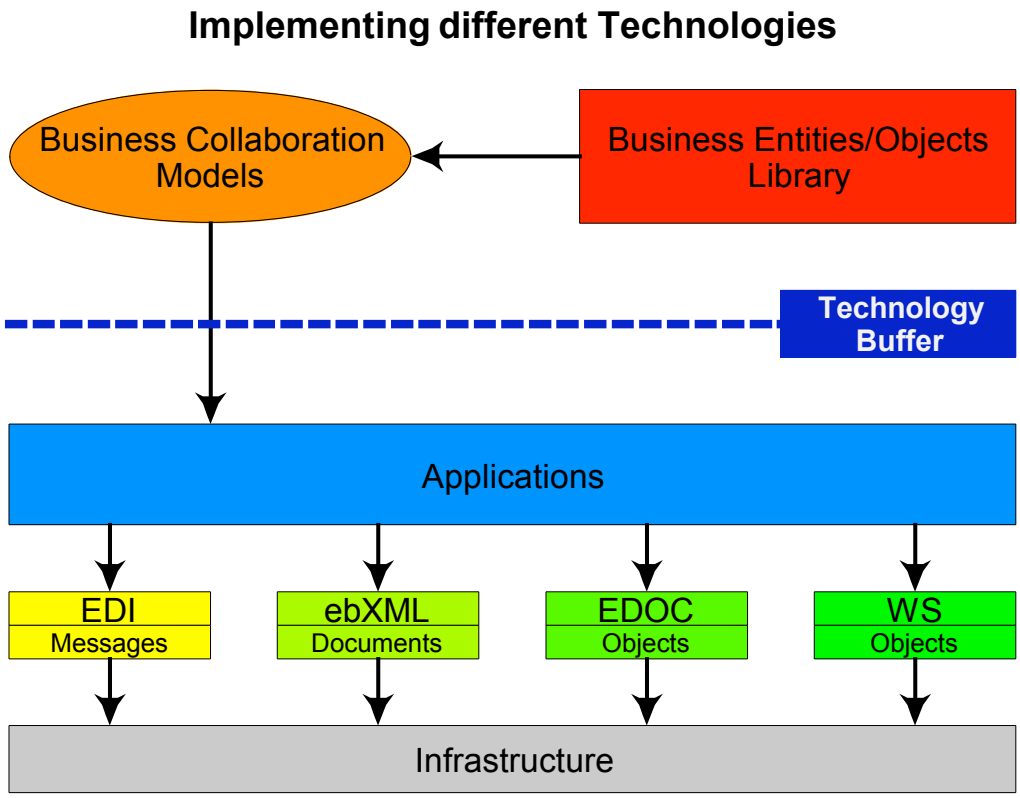

Figure 2 – Separating the "What" from the "How"

Business Collaboration Framework

Introduction

The primary goal of the BCF (Figure 3) is to capture the business knowledge that enables the development of low cost software components to help the small and medium size companies and emerging economies engage in e-Business practices. By focusing on developing business process and information models in a technology-neutral manner, the BCF provides insurance against obsolescence by allowing recasting of the business scenarios into new information exchange technologies.

At the heart of the BCF is the UN/CEFACT Modeling Methodology (UMM). The UMM is an incremental business process and information model construction methodology that provides levels of specification granularity that are suitable for communicating the model to business practitioners, business application integrators and network application solution providers.

A commercial trading agreement is modeled as a business collaboration model according to the UMM Meta Model (the model that defines the UMM modeling language). The UMM Meta Model is defined as an extension of the UML Meta Model by extending the UML stereotype syntax and semantics with the syntax and semantics of the business collaboration domain.

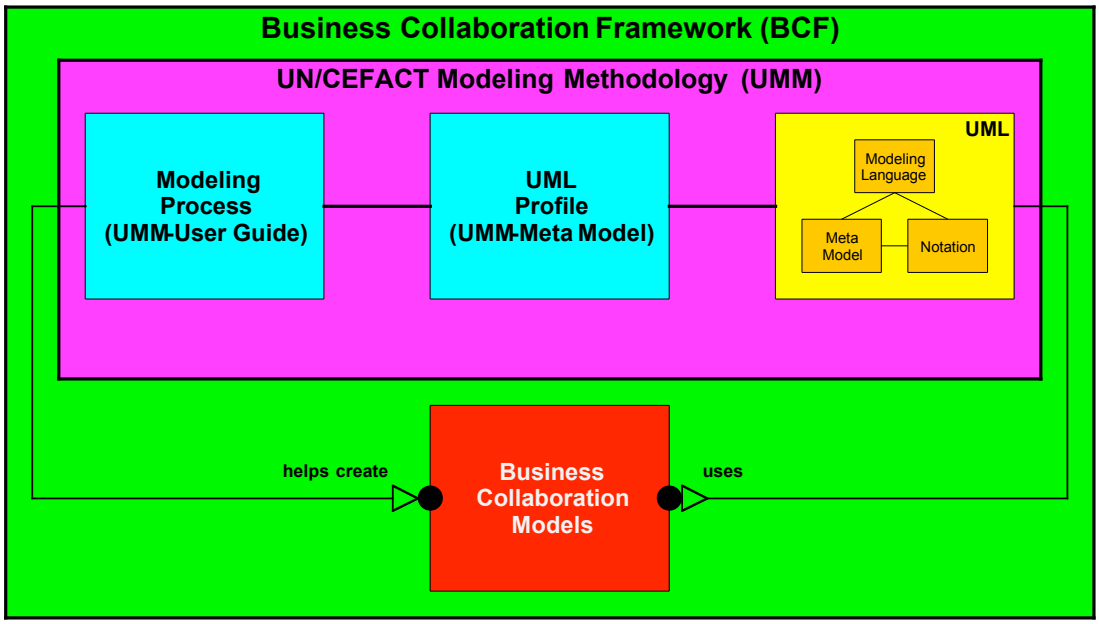

Figure 3 – Business Collaboration Framework Overview

Architectural Structure

The Business Collaboration Framework architectural structure comprises a set of architectures, patterns and business semantics defined in accordance with certain business reference models and ontologies. This framework provides for the reification of process and information definition from one view or perspective to the next without the loss of semantic or computational integrity. The framework consists of 5 views, business collaboration patterns, business transaction patterns, service interaction and information patterns, as well as a well-formed meta-model which defines the syntax and semantics for each view. Uniformity of notation and precision of semantics provide concise and unambiguous business process definitions.

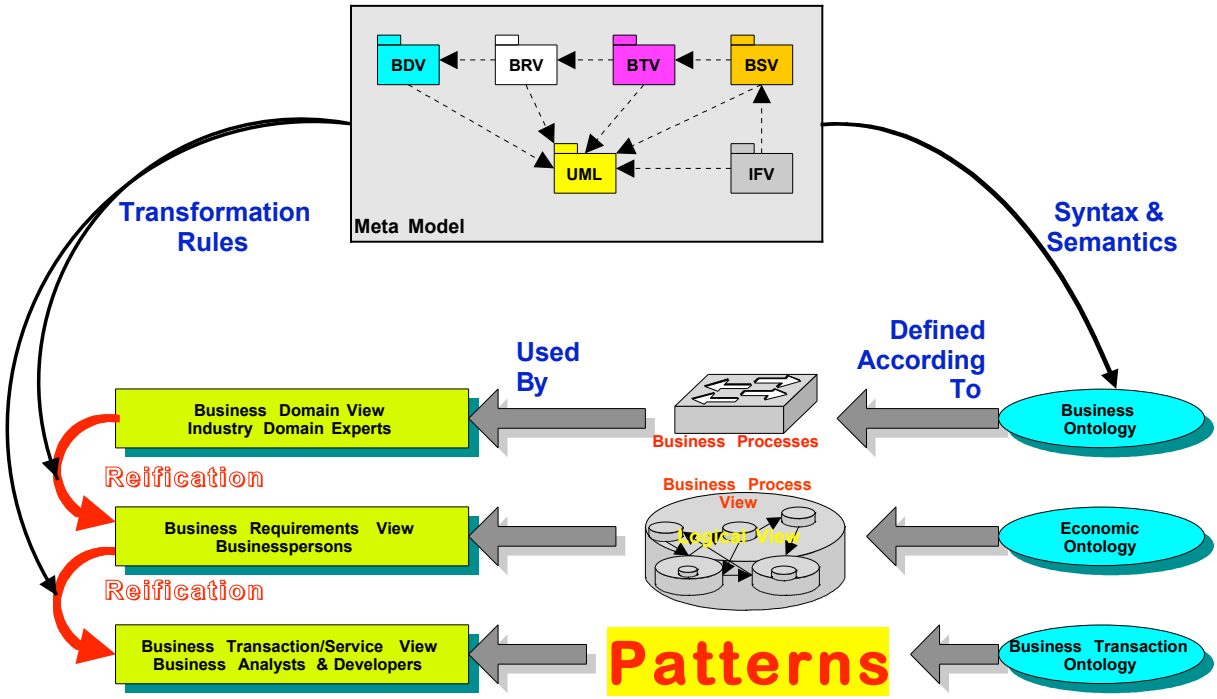

Figure 4 – BCF Architecture

Meta Model

The BCF consists of the UMM Meta Model that defines the syntax and semantics of the terminology used at each of the business views according to a reference ontology. In order to ensure the computational accuracy of the Meta Model, a specification language needs to form the foundation. The Unified Modeling Language (UML) was selected for this purpose. Though UML offers the strength and convenience of a graphical notation, the precision of the specification and modeling elements made it the most suitable choice available.

The BCF is technology neutral with regards the to the solution specification. This infers that the solution was not defined in context or with respect to a particular technology. This decoupling of the underlying technology from the business process and information solution is a critical enabler of the BCF. It is this aspect that allows the businessperson to specify 'their' solution with the assurance that the underlying technology won't redefine it. This approach was pioneered and advanced by the TeleManagement Forum where it received the Smithsonian Institute 'Most Significant Technology' for 1998 award.

BCF Views

The *Implementation Framework View (IFV)* provides the lowest level of semantics for the framework and provides for the decoupling of the specified solution from the underlying enabling technology. The IFV defines the nominal set of elements required to specify a targeted technology. So long as the targeted technology facilitates the elements defined in the IFV, it is assured to have the set of technical capabilities required for implementation. The next higher view up the BCF stack is the Business Service View(BSV). The BSV is the view of a business process that specifies the network component services and agents and the information (message) exchanged as interactions which are necessary to execute and validate a business process. Next, is the Business Transaction View (BTV). The BTV is the view of a business process that captures the semantics of business information and business transactions amongst business partners as they perform business activities. The Business Requirements View (BRV) provides a view of a business process as an elaboration of business scenarios, resources, business events, and constraints for business collaborations and their interrelationships. The Business Domain View (BDV) provides a framework for understanding business area and process interrelationships. A BDV is typically a domain specific business reference model that is used to categorize a business process to aid in business process identification, business process integration, and auto discovery.

Business Patterns and Ontologies

In that a businessperson may trust and be familiar with a solution and embrace it as viable, this will not induce him to deploy the solution. Along with profitability, the solution must be convenient. It must accessible, usable and require no more skill than the businessperson currently has. Business patterns allow the definition and construction of sets predefined templates and solutions according to a structure that is easy to use and allows the business person construct solutions without worrying about approaches, styles or techniques. Patterns also facilitate mechanisms to ensure the completeness and well-formedness of a solution.

To discover the right set of patterns for a particular domain can and does require a large amount of research and discovery. Since a pattern is a structural and semantic definition of a set of concepts within a domain, it would prove convenient if these sets of concepts were already available for the definitions of these patterns. In that an ontology is the definition of a set of concepts within the scope of a particular domain, there is suitable rationale to identify business ontologies as the basis of business patterns.

The reference model/ontology for the Business Service View (BSV) comes from the "*UN/ECE RECOMMENDATION No.26, THE COMMERCIAL USE OF INTERCHANGE AGREEMENTS FOR ELECTRONIC DATA INTERCHANGE"*. This is the same recommendation that forms the basis of traditional 'edi'. Organizations like ASC X12 and UN/EDIFACT have used this recommendation as a foundation for the development of their standards and practices. By employing the same ontology at this view, we take advantage of the experience and knowledge of those who have invested years into this problem space and adopt a logical foundation of a known and proven architecture. With all of it's deficiencies, 'EDI' does work. Using this reference model does not facilitate reverse compatibility,

however, it does enable a forward migration path for users of traditional 'edi' users when they are ready to move into newer technologies. This reference model results in the definition of 24 discrete interaction patterns suitable in effecting all required document inter-exchanges.

The reference model/ontology for the Business Transaction View (BTV) comes from *The Commercial use of Electronic Data Interchange, Section of Business Law American Bar Association, A report and model trading partner agreemen*t and *PART 2 UNIFORM RULES OF CONDUCT FOR INTERCHANGE OF TRADE DATA BY TELETRANSMISSION (UNCID), CHAPTER 2 - Text of the Uniform Rules of Conduct*. These ontologies define all the evidentiary requirements for 'legally-binding', enforceable business transactions. Whether the conduct of these transactions are within the governance of a state agent (e.g. court of law) or the governance of a company department head or manager, the rules and human behaviour regarding proof of action, conduct and fulfilment of expectations remain the same. For this reason the patterns defined from this ontology works equally well within a private or corporate environment as they do in a public or commercial trade environment.

The Business Requirements View (BRV) defines the semantics that persons and businesses use to describe their collaborative units of work or activities. These activities represent the processes and resources used to achieve certain definable goals or objectives, the economics of a system. (R)esources, (E)vents (indication of a process result) and (A)gents (participants) are the key elements of an economic ontology known as, "*The REA Accounting Model: A Generalized Framework for Accounting Systems in a Shared Data Environment"*. REA forms the basis of macro economic and accounting models and pattern definition for business collaborations with the BRV.

BCF Patterns

Patterns are reusable, generalized business process abstractions that can be applied to many domains. Patterns are subjective constructions that meet the requirements of specific business process scenarios.

Patterns are applications of the various ontologies to common business process and information representations. Common business process and information representations capture common structure and semantics applicable to specific business process domains.

The key to repeatable business process and information model constructions is the application of patterns to specific business process scenarios. While patterns can be expressed for business processes at various levels, the BCF currently includes patterns for business transaction activities and their associated service collaborations. Six patterns are defined for the business transactions that have been identified to date. The business transaction patterns are:

Commercial Transaction - used to model the "*offer and acceptance*" business transaction process that results in a residual obligation between both parties to fulfill the terms of the contract

Query/Response – used to query for information that a responding partner already has e.g. against a fixed data set that resides in a database

Request/Response - used for business contracts when an initiating partner requests information that a responding partner already has and when the request for business information requires a complex interdependent set of results

Request/Confirm - used for business contracts where an initiating partner requests confirmation about their status with respect to previously established contracts or with respect to a responding partner's business rules

Information Distribution - used to model an *informal* information exchange business transaction that therefore has no non-repudiation requirements

Notification - used to model a *formal* information exchange business transaction that therefore has non-repudiation requirements

These business transaction activity patterns comprehensively cover all the known legally binding collaborations at the lowest level of request/response interaction between two business applications (Decision Making Applications in ISO/IEC 14662). The specific business transaction activity pattern(s) used in a business collaboration is(are) based on extracting information from business

domain experts via answers to questions asked according to a standard script in the Business Modelling and Requirements workflows.

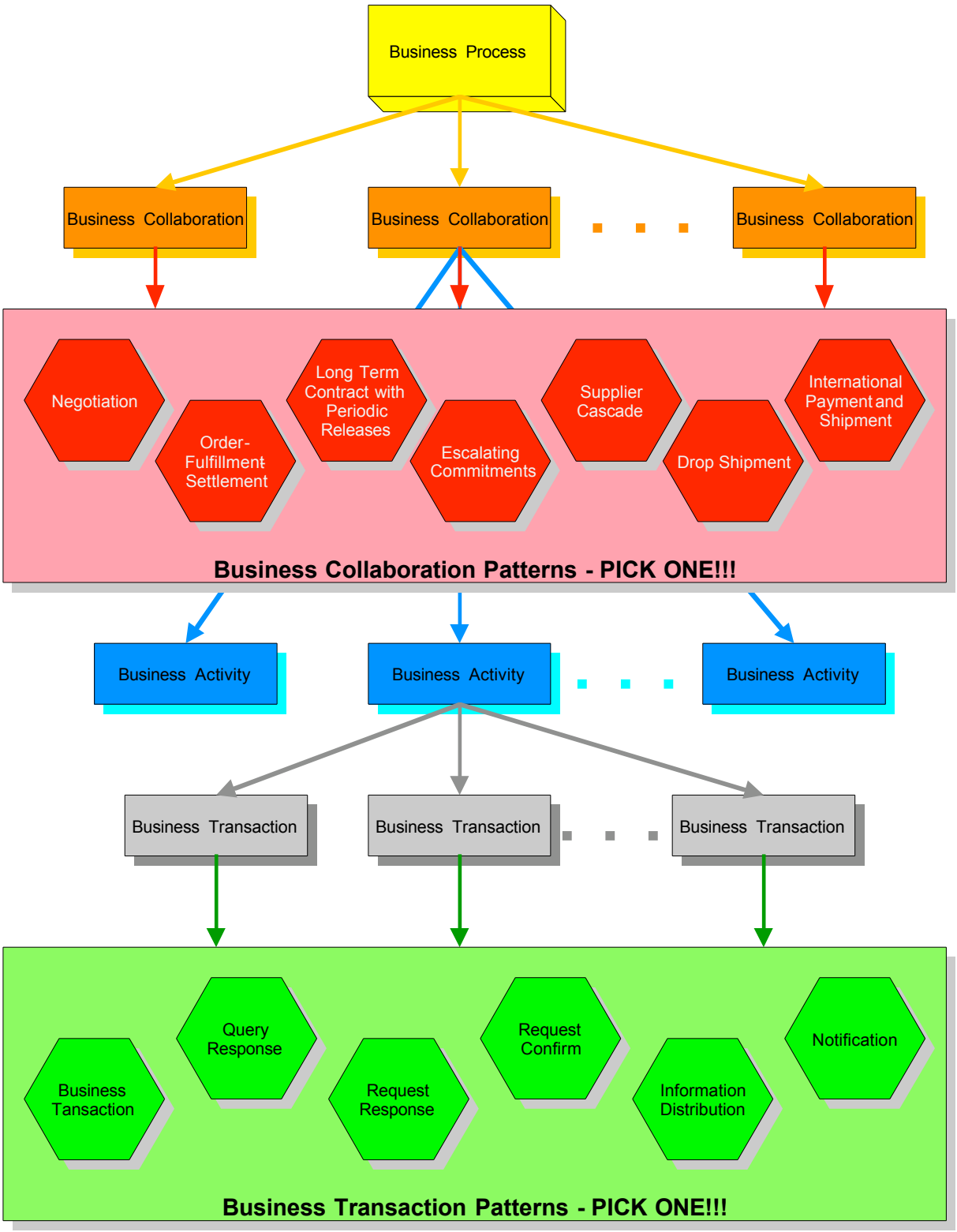

Figure 5 – BCF Overview

Predefined design patterns are described for service collaborations appropriate for each business transaction pattern. These service interaction patterns specify specific interaction sequences between two application systems (referred to as Information Processing Domains in ISO/IEC 14662), i.e.,

protocols, of message exchanges, according to the type of business transaction, type of role, security and timing parameters. The specific service interaction pattern is derived from information gathered in the requirements workflow.

Bottom Line – Ending up with Business Information Exchanges

Scope of engagement between partners

A business environment may be large and complex. Understanding such a business environment begins with information and documentation provided by business experts. Business experts provide a categorization and decomposition of the business environment into business areas, process areas, and business processes. Business processes are further decomposed into business process activities in order to understand how the stakeholders in this business environment view the discreet units of work done within their organization. Business process activities are either one-partner activities or multi-partner activities.

Business process activities that are multi-partner activities are by definition business collaboration activities. Business process activities that are collaborative extend outside the organization. Business collaboration activities define the scope for business requirements gathering and specification. Since the business environment includes identification of requirements placed by one-partner activities on multi-partner activities, the interaction of one-partner activities with multi-partner activities needs to be taken into account as well. All of this takes place in the language of the business environment experts and stakeholders.

Business Requirements

A business collaboration activity is a predefined set of activities and/or processes of partners that are initiated by a partner to accomplish an explicitly shared business goal and terminated upon recognition of one of the agreed conclusions by all the involved partners. Business information is gathered for the purpose of specifying business collaboration activities in terms of goals, requirements, and constraints. These are then expressed in formal representations that can be understood and confirmed by the business environment experts. Business collaboration activities are specified by a business process analyst as use cases, requirements and business object flow graphs that define the choreography of atomic business processes, referred to as Business Transactions. The selection of a business collaboration pattern that fits the requirements of a business collaboration activity, if one is available, optimizes business process and information model reusability. However, in the absence of a suitable business collaboration pattern, the selection of pre-specified Business Transaction patterns simplifies and prescribes reusable components in a business collaboration activity.

Business requirements are expressed with reference to business information structures that are affected by a business collaboration activity, e.g., order information, customer information. Preconditions and post conditions of the atomic business processes and of the business collaboration itself are best expressed by states of affected business entities, e.g., customer information - pending and customer information - accepted. In support of this, business entities (BEs) must be understood as to the states in which they may exist and the permitted state transitions in one or more life cycles. Business requirements are also expressed in terms of events that trigger the state transitions of BEs and of the business collaboration, e.g., receipt of a Positive Registration Response triggers the transition of Customer Information from tendered to assigned.

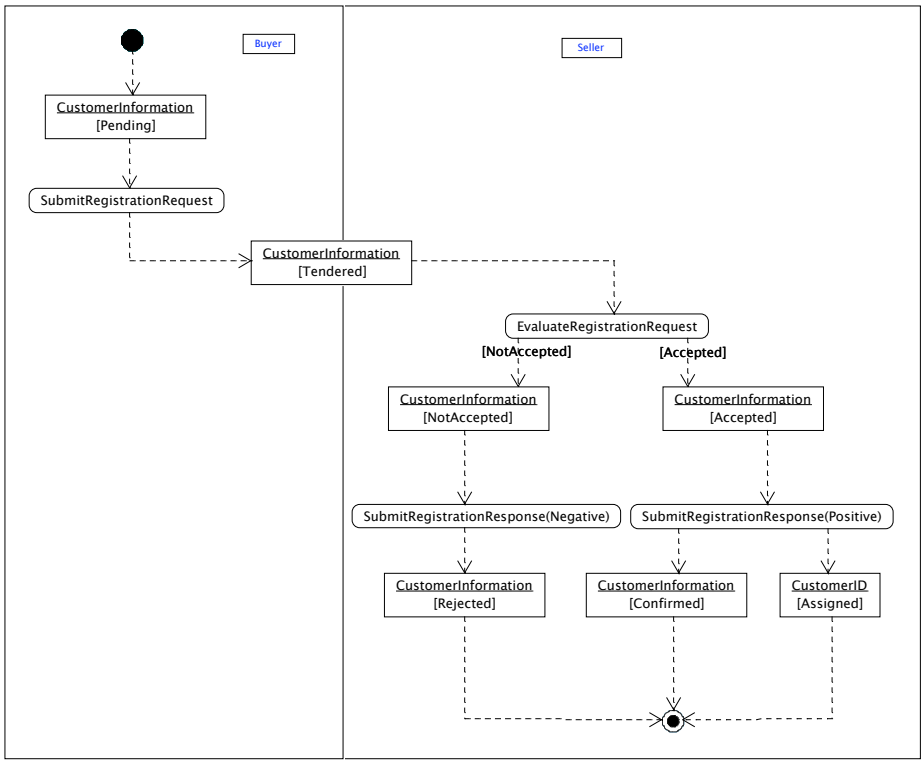

Figure 6 - Business Entity Life Cycle

Business Information Construction

Analysis of the business requirements specifications is required to define the contents of business information to be exchanged in a business collaboration. Business information that is exchanged must contain information needed to identify the BEs affected by a Business Transaction. In addition, business information structures contain information content that satisfies the requirements for exchange of information required to be shared in the business collaboration. Shared information is generally the attributes of affected business objects (BOs) that must be shared in order to align the partners' views of those BOs.

In order to construct business information exchanges with standardized information items, reference is made to (BOs) in a registry as the primary source. If, in the business information modeling workflow, appropriate attributes of BOs cannot be found, new BOs must be defined. A resource for defining new BOs would be core components (CC) and business information entities (BIEs). The selection of BIEs, or the creation of BIEs when they cannot be found in the core component registry, makes use of the core component context categories and rules. (Context categories should already be identified in the requirements gathering step and can be checked off at this point to utilize the core component context rules.) As appropriate BIEs are selected or created, they are included as attributes in the newly defined BOs, which are registered for subsequent reuse. However, in the normal business information modeling workflow, BIEs would not be used directly to create Business Information structures, but would be used as needed to define BOs, which would then be used to create Business Information structures. These modeled Business Information structures would then become payloads by applying messaging technology specific syntax, e.g., XML, according to production rules.

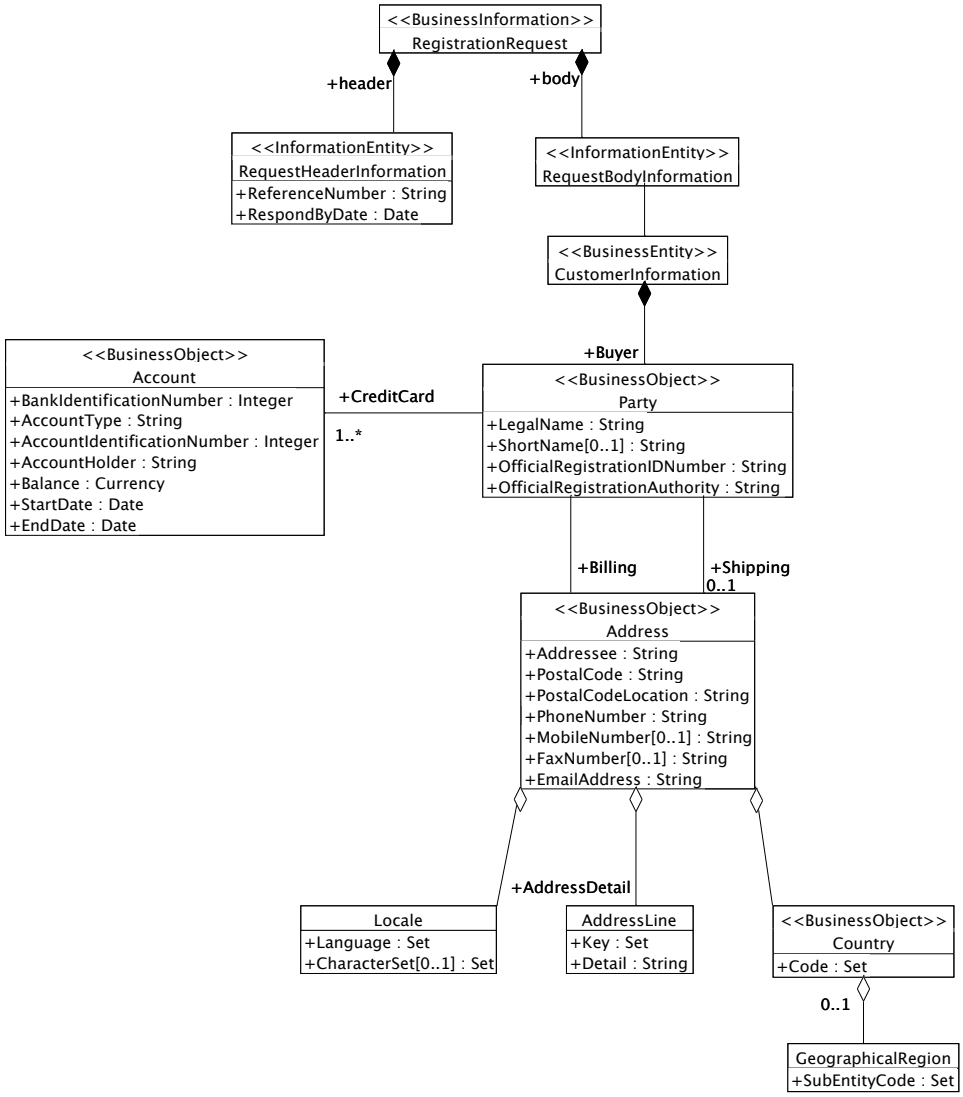

Figure 7 – Business Information Structure

The Business Collaboration Framework constitutes the new e-Business standard. This new standard is independent of the interchange data syntax, transport infrastructure, and server software. Therefore it satisfies the UN/CEFACT e-Business Vision for a "framework" that utilizes Business Process and Information Modeling, UML and UN/CEFACT's Modeling Methodology (UMM) in such a way that any industry group or standards body, including UN/CEFACT, can create models that identify every possible activity to achieve a specific business goal.

Business Collaboration models would be registered and stored in a global "virtual" repository. A user (trading partner - TP) would register "its" particular path/paths through the model (scenario(s)) so that others who want to engage with that TP could determine if they share at least one scenario. To ensure that the models not only follow the underlying UMM Meta Model but also are interoperable, the models would incorporate reusable and most common objects (Business Objects/Business Entities) that would be used by the modelers as they document a particular business Collaboration. *However, the messaging format, packaging and routing and the meta-model for the repository are not defined by UN/CEFACT but by the underlying implementation and infrastructure technology.*

Business Collaboration Framework and Web Services

XML's Role in e-Business

From a business viewpoint, doing business electronically means having a ubiquitous Internet dial tone; a promise Web Services can fulfil. Because, from the software vendors view point, doing business

electronically means setting up and operating Web Services. All the major IT vendors are rolling out road maps and new product sets that will 'enable your business'. However, the underlying technologies for today's World Wide Web (WWW) "TCP/IP, HTTP and HTML" are limited in their capacity to support what businesses actually need: to find each other; to buy/sell services from each other; to find potential markets; and to have all this in a seamless, straightforward, predictable e-world. The key is systems interoperability, both between businesses and, more importantly, within a business. This desire is not new, but what is, are the capabilities offered by new technologies based on XML.

Is XML enough for e-Business?

XML and e-Business is synonymous with Web Services. Therefore, one must look at Web Services to determine if it has what it takes to provide the full solution for e-Business. Many feel that Web Services have the potential to transform e-Business into a plug-and-play affair. Not only will Web Services simplify how businesses will interconnect, they will also enable businesses to find each other. One reason for the increased interest in Web Services is the promise of interoperability, in the same way that Web pages can be accessed from anywhere on the Internet. However, complex standards are needed to achieve true interoperability, not only at the messaging and transport layer, but also at the business (application) layer. The success of Web Services will depend on how easily businesses will be able to engage interoperability at all levels.

There are many efforts in standardizing Web Services, but none of them provide the required features for e-Business transactions. Web Service standards only address the infrastructure side. There is a need to provide standards for interoperability at the business layer. UN/CEFACT is addressing this aspect of standardization with its the "Business Collaboration Framework".

Web Services and Business Collaboration

There is a clear relation between the Web Services and the BCF. Most organizations are eager to jump onto the Web Services bandwagon but they also need to maintain standards to ensure inter-operability between their applications and their trading partners' applications. Organizations will take Web Services technologies like BPEL, WSDL, UDDI and SOAP and understand their application within the realm of other e-Business standard such as the BCF. Web Services technologies must be applied within the context of standards such as the BCF, or they will end up with simple, stateless Web Services, and not the complex and collaborative business transactions that organizations are longing for.

To achieve transaction integration doesn’t automatically mean wholesale conversion to one specific technology. One needs to put a digital communication system through the whole business irrespective of who the software provider is and what the application are, so that the work flows and processes are available across the business. It does however help if organizations stuck to one specific infrastructure technology.

It’s time to look at available technologies in the total context, so that whether one is talking about development platforms, or about building next-generation natural language based speech interfaces, or using open web services to connect business partners, one must have a common theme in mind - to use the Internet, as a whole. What’s needed to bring this vision to reality is a common vision shared by users (businesses) and software vendors.

Business to Business Integration

Two distinct trends will help to solve the platform plurality problem. First, there is a consensus that of the different technologies available for eCommerce development, companies should standardize on either J2EE (Java 2 Enterprise Edition) or Microsoft.NET - or even both. Secondly, Web Services, virtually removing the problem altogether since they are based on open standards - irrespective of Microsoft or Java - they will be a uniting theme around the enterprise.

This Web Service trend will also help business-to-business integration; and so too will XML. For years, organizations have been able to communicate electronically using e-mail, yet it seems incredible that without an expensive investment in traditional EDI, issuing an invoice usually entails printing and mailing a piece of paper.

This too will start to change because of another key standard in the adoption of Web Services – the BCF, which provides an open technology-neutral framework for interoperability at the Business Layer. Undoubtedly, such a fundamental cultural change away from paper to electronic transactions won't stand much chance of success without a champion.

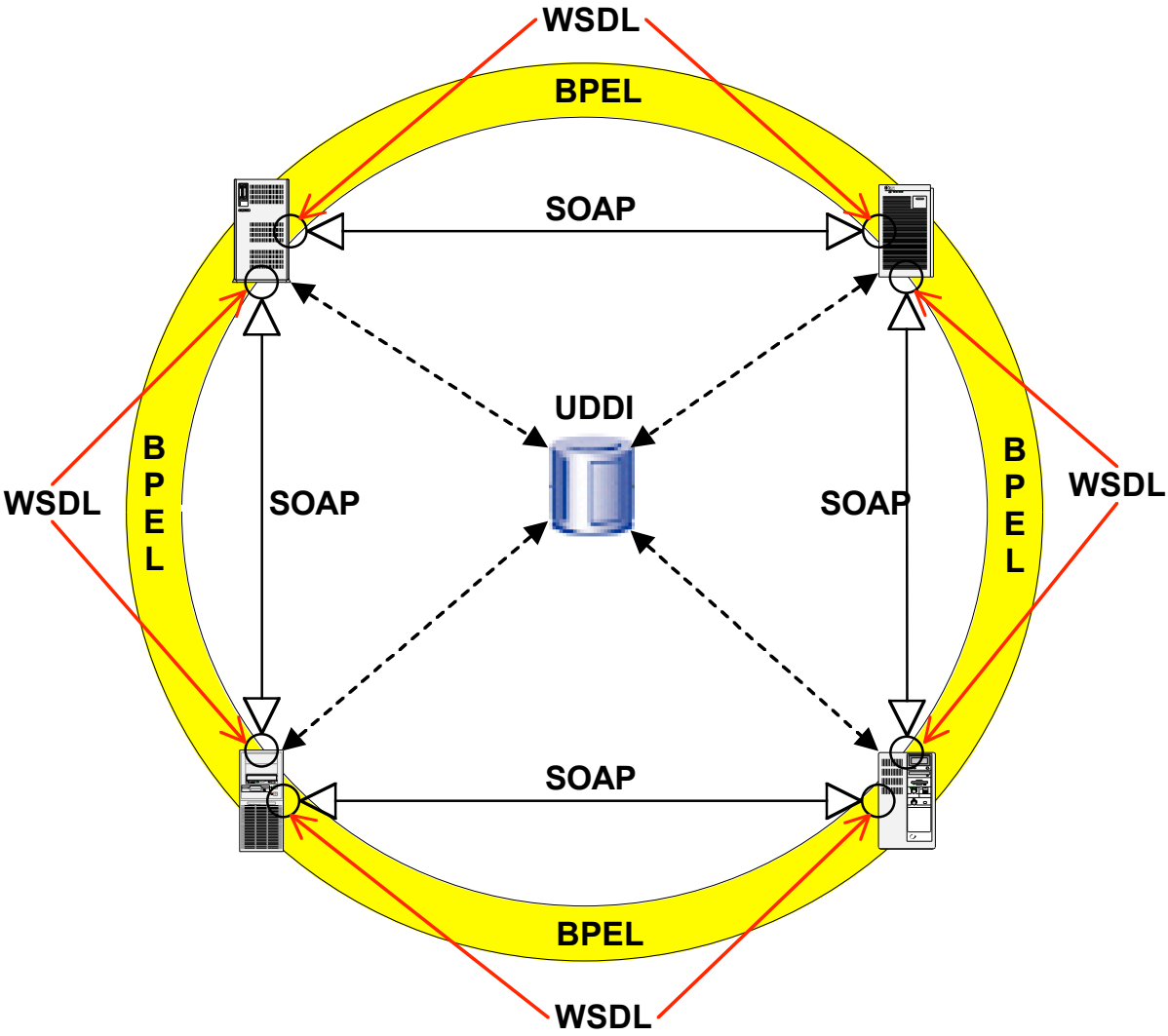

Figure 8 – Web Service Standards Overview

Conclusion

UN/CEFACT's vision for e-Business is to create a single global electronic marketplace where enterprises of any size and in any geographical location can meet and conduct business with each other through the exchange of relevant business information.

In order for enterprises to conduct electronic business with each other, they must first discover each other and the products and services they have to offer. They then must determine which business processes and documents are necessary to obtain those products and services. After that, they need to determine how the exchange of information will take place and then agree on contractual terms and conditions. Once all of this is accomplished, they can then exchange information and products/services according to these agreements.

To facilitate this, Web Services and the BCF provide an infrastructure for data communication interoperability, a semantic framework for commercial interoperability, and a mechanism that allows enterprises to find, establish a relationship, and conduct business with each other. Data communication

interoperability is ensured by a standard message transport mechanism with a well-defined interface, packaging rules, and a predictable delivery model, as well as an interface to handle incoming and outgoing messages at either end.

Commercial interoperability is provided by means of specifications for defining business processes and core components and a context model for defining Business Information Structures. The BCF recommends a methodology and provides a set of worksheets and guidelines for creating those models. A business library (catalog) of business process and information models promotes business efficiency by encouraging reuse of business processes or parts of predefined business processes.

In order for the actual conduct of business to take place, Web Services provides a shared repository where businesses can discover each other's business offering by means of partner profile information, a process for establishing an agreement to do business, and a shared repository for company profiles, business-process-specifications, and relevant business information structures.