

# Object Management Group

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## Request for Proposal

### Conversion Models for Payment Message Standards

This version without boilerplate text: OMG Document finance/2005-11-01  
Official version with boilerplate text: OMG Document dtc/2005-09-13

**Letters of Intent due: February 20, 2006**  
**Submissions due: April 3, 2006**

#### **Objective of this Request for Proposal (RFP)**

The Finance Domain Task Force of the Object Management Group (OMG) is soliciting proposals for standard conversions of electronic payment messages from one message format into another message format. Payment data formats selected by the respondents for mapping must include a specified set of messages and, in addition, could include other payment message formats currently in use or those scheduled for future use. The selected message conversions will be defined using MOF specified modeling languages. The specified data conversions should be structured to be lossless.

The Finance Domain Task Force also solicits definitions of patterns and rules for using data transformations to more generally specify lossless payment message conversions. Thus others can extend the coverage of standardized message conversions to new public payment message formats and between public payment formats and their internal or proprietary formats.

For further details see Chapter 6 of this document

## **6.0 Specific Requirements on Proposals**

### **6.1 Problem Statement**

Following the Internet revolution, more and more institutions and enterprises are moving their inter-enterprise business processes onto private and public networks. Payments are the most universal transaction needed to support these inter-enterprise business processes. A payment transaction is required by all those involved in commerce -- retail, wholesale, consumer, corporation, etc.

#### **6.1.1 Disparate Payment Message Standards**

Facilitating and mediating payments is a fundamental function for Financial Institutions. These institutions find themselves having to handle an increasingly larger number of electronic payments with diverse characteristics over new transports and channels. For example, the birth of entirely new sales channels on the World Wide Web – EBay, Yahoo, Google, and Amazon.com -- and the exponential growth in connectivity among all business and consumers by means of Internet Protocol, have required characteristics of electronic payments that had never been imagined by the original designers of payment message formats. Because of the expense and difficulty of introducing or changing payment message standards, Financial Institutions often reuse and overload existing payment message formats to meet these new needs. For example, banks are provisioning person to person payments using Visa payment cards and using ACH for on-line bill payments as a substitute for paper check. This “overloaded” reuse of existing message formats engenders transformational errors that delay products from reaching waiting markets, increase back-office costs, reduce effectiveness of fraud controls, and lower sales volumes. In addition separate payment networks with their own set of standard messages have evolved to serve the needs of different markets and communities. These once distinct electronic payment networks have been interconnected into a global, heterogeneous, but haphazardly constructed payment network. The haphazard growth combined with new formats for new types of payment transactions has created a global challenge not unlike the one that occurred during the 19<sup>th</sup> century when countries found that their railroads did not connect with their trading partners because track sizes were dissimilar.

#### **6.1.2 The high of Cost of Today’s Payment Messaging Standards**

The global market demand that caused the world’s financial institutions to connect multiple, disparate, and functionally dissimilar payment data formats has produced a wide range of different, costly, data conversion errors. These errors occur because software development teams work too quickly to adapt their

legacy payment processing systems to modern payment processing requirements. These ad hoc adaptations introduce programmatic data errors that infect all electronic payment messages and transactions, regardless of payment format or network.

Today, payment data errors are common in the global electronic payments networks. Members of the Finance Domain Task Force have learned from industry representatives about costs of errors equal to 2% of payment volume. If these losses are as widespread as the financial industry presently believes, then the drag on the world economy could be in excess of USD \$ 3 trillion.

### 6.1.3 Benefits of Standardized Message Conversion Maps

The Finance Domain Task Force intends to formulate and publish standardized, structured, certifiable message format conversions so that messages can be moved confidently from one payment network to another and message formats can evolve without requiring legacy applications to abandon the older formats.

The widespread use of message conversion standards will significantly reduce the trillion dollar cost and the engendered inefficiency of payment data errors.

The increased quality and reliability of conversions among payment data types will improve fraud detection; heighten customer satisfaction, lower exception handling costs by back-office operations, and cut time-to-market for new payment products and services.

The improved interoperability of payment message formats through standardized conversions across different payment networks and protocols will provide product managers, payment network operations, and information technology suppliers for the financial industry, with tools to automate data transformation with an assurance that the resulting transformations are accurate and reliable.

Additionally, the standardized conversions will alleviate concerns about the more subtle issues with regard to keeping payment messages consistent over time; i.e., between evolving versions of the same message type. Given precisely defined and effective conversions, messages formats can change and new message formats may be introduced without disrupting the stability of a system, or incurring costs for modifying legacy applications. It will also extend the reach of legacy applications beyond networks and standards to which they are coded, by permitting operations personnel to confidently send and receive messages through any number of payment networks.

#### 6.1.4 Conversion Maps – Required for a Complete Solution

The Financial Services industry's initial response to the plethora of message standards was a number of initiatives to harmonize standards and to define common models for payments that would be an acceptable union of these standards. It is important to note that most of this harmonization work, such as the IST Harmonization initiative and the ISO20022 process, often embraced, at least in spirit, MDA concepts using UML modeling approaches and UML-to-XML mappings.

Unfortunately the definition of a common model alone has not yet, and may not, dramatically improve payment automation. The root cause of the problem is the cost of implementing new standards given the huge investment in legacy applications that often use twenty to thirty year-old technology for payment information transport. To accommodate new standards, thousands of applications have to change, the effort costing the industry billions, perhaps trillions, of dollars. For example, a major payments network estimates that changing one field in one of its payments messages costs the Financial Service industry over USD \$0.5 billion. While enterprises understand the value of new, harmonized, standard message formats, this value often does not justify the cost of adapting a particular legacy application for the new message format. By definition, a legacy application adequately does its job with the older message format, changing that application to accommodate a new format is a cost with little hope of return on investment. Also, message format changes must occur at the same time among thousands of users so they are difficult and costly to orchestrate across the industry.

Effective global payment interoperability can be improved by the synthesis of these common payment modeling efforts with standardized message conversions. By lowering the cost of adopting these common models, the quality of the global payments network will be significantly increased.

#### 6.1.5 Industry Standard Conversion Maps Based on OMG Standards

The software industry has offered message conversion solutions through middleware and enterprise application integration (EAI) products. However, these solutions tend to be platform-specific, proprietary and expensive. From an industry point of view, proprietary solutions do not effectively address the problem as there is no assurance that middleware and middleware tools will produce reliable, standardized conversions from one message format to another. Until industry wide, easily realized payment message conversion standards exist, full automation and improved straight-through processing for cross-enterprise payments will be stymied.

OMG MOF-based modeling languages, e.g., UML, can be used to create conversion maps from one payment message format to another or from one payment transaction to another. (This RFP utilizes the term “conversion” and “conversion map” to refer to the requested maps that define how to map data from one payment message format to another message format.) Testing procedures can also be defined so that implementations of a map can be certified. These maps can then provide industry-wide standards for conversions that any development shop or vendor can implement. Given patterns and rules for creating conversion maps, new conversion can be created and provided to the industry as needs evolve. Also given patterns and rules, enterprise developers can create consistent conversion maps between internal data formats and public message standards.

## **6.2 Scope of Proposals Sought**

This RFP solicits proposals for standardized conversion maps among a number of industry standard payment message formats, specifically dealing with the difficult issue of lossless information conversions. The proposals should also present patterns, rules and a methodology for creating new lossless conversion maps. In addition, the proposal should specify testing mechanism which can be used to certify conversion maps.

In this RFP the term “pattern” refers to a reusable model of a specific aspect of the conversion process; e.g., there may be a pattern for mapping information to an auxiliary source; for aggregating information from two sources into one target field; etc.

### **6.2.1 Transformation Maps**

Proposals are requested for MOF-based models of data transformation specifications for conversions among public and proprietary payment standards including ISO 8583, ISTM, IFX, SWIFT, VisaNet TCR, and for conversions between older and newer versions of each these standards. These MOF-based data transformation models that define the conversion map between a source message and a target message can be codified as standards. Such standardized conversion maps could then be used as the basis for designing actual components that execute conversions. Given industry accepted conversion models, coded components could be certified through standardized testing, thus assuring standardization and quality.

### **MOF-Compatible Metamodels**

A requirement for creating MOF-based conversion maps to define a data conversion is that the source and target formats must be instances of a MOF-compatible metamodel.

For example, the MOF-based CWM specification defines a number of such data metamodels, and specifies rules for defining additional, compatible metamodels for forms of data that CWM does not explicitly cover. Given a CWM-based approach, an XML message format can be treated as an instance of CWM's XML metamodel; however, a CWM-compatible EDIFACT metamodel would be needed to accommodate SWIFT's FIN messages, since these are defined as EDIFACT messages.

This RFP requires the identification and specification of MOF-compatible metamodels where necessary.

### 6.2.2 Procedural Expressions

Conversion maps would likely include procedural expressions to be applied when mapping an element of information from a source to a target. This RFP does not dictate the syntax or semantics of the procedural expressions that define these mapping functions. The proposal needs to specify a language for these procedural expressions, perhaps based on an existing language such as OCL, JavaScript, or XQuery. The language is only meant to be an expression language, providing simple infix operators and the ability to call procedures through a defined API. In addition, the proposal needs to include the specification for a library of procedures that will accomplish the large majority of required transformations. The procedure library needs to cover a wide-range of operations from the simple mapping of one field to another field, to very complex operations, e.g., moving information from unstructured and semi-structured forms to structured forms, moving information from fixed and bounded formats to variable formats, mapping repetition, etc.

Examples of the use of a procedural expression using library procedures would be:

- Extract the first five bytes of a source field and assign them to a target field.
- Transform a source code into a target string by looking up the value string in an external conversion table.
- Concatenate two character fields in a source to one field in a target.
- Transform a code using a table lookup

### 6.2.3 Graphical Syntax for Conversion Maps

Conversion maps between a source and target should be render-able in both a machine processable XMI format and in a graphic format for human readability. Proposed graphic displays of the conversion models should be clear enough that they can be understood by those who do not have a high degree of expertise in MDA.

#### 6.2.4 Mapping to a Common Model

Mappings are defined as a binary operation from a source message format to a target message format, so a complete mapping would entail  $(2n-2)^2$  conversions, where  $n$  is the number of message formats in the set. Accommodating a version change in the format of a single message type would still require modifications to  $2n-2$  conversion maps. If all messages are mapped to/from a common model then only  $2n$  conversion models would have to be produced for a covering and only 2 conversion maps would have to be modified to accommodate a change in a single format. Much of the current standards work in the payments area has been focused on defining common models for payment-related transactions. Often these approaches have used MDA methodology to define these common models, e.g., ISO 20022.

Proposals should identify an existing model that can directly serve or can be adapted to serve as the common payments model. This common payment model must be a reasonable superset of all of the payment-related message standards to be mapped. It need not be the “perfect” common model as later changes to this common model can themselves be accommodated with a conversion model. The specification of attributes in this common payment model should have few restrictions on format and type so that mapping to and from various formats will be relatively straightforward. The IST Harmonization group’s payment message kernel is a good point of departure for arriving at this common model.

#### 6.2.5 Handling Lossless conversions

The biggest obstacle in creating useful conversions is that in many mappings information can be lost.

For example:

- It is easy to map an attribute from a fixed 16 byte field in a source message format to a 24 byte field in a target format. However mapping from a 24 byte field to 16 byte field is not possible without an agreed upon means of preserving the information that would be lost in those missing 8 bytes.
- A new version of a message may include additional attributes or fields that have been added to the older version. The information contained in these new fields would ordinarily be lost in the conversion from the new version to the old.
- The set of allowable values for a common field in two different formats may be an intersection instead of union. Any out-of-bounds values can not be mapped and therefore information may be lost

A successful data conversion approach must strive for lossless transactions within the context of the transaction, especially within the context of a multi-party transaction. A simple measure of a lossless transformation is one in which a round-trip mapping preserves all information.

For example:

- A field in message A is mapped to a field in message B and then is remapped back to the same field in A. The final value in the field of A after the re-mapping should be the same as the original value in that field.

Providing lossless transaction will often involve storing the remainder information in auxiliary structures that can later be queried when information needs to be reconstructed. A key to effective lossless conversions will be locating and identifying the right remainder information associated with source data to be able to perform the reconstruction. Execution of the proposal must result in mapping patterns and a library of procedural expressions that support lossless conversions, including the effective persistence of remainder information.

#### 6.2.6 Extensibility Framework

It is likely users of the new payment conversion standard will wish to extend the standard to include additional payment messages formats, some of them proprietary. The execution of the proposal should result in a set of patterns that will provide a consistency of approach for all conversion models. In particular, patterns must be presented for lossless conversion that, themselves, can become accepted industry standards.

To both illustrate and prove the methodology presented in the proposal, the proposal needs to include a specific example of using the methodology and patterns to map an additional message format.

### 6.3 Relationship to Existing OMG Specifications

Proposals should rely on OMG standards as much as possible.

Relevant standards include:

- CWM 1.1 – CWM provides for data transformation that can be used in a conversion map,
- UML 2.0 – UML provides a mechanism for modeling a conversion map,
- MOF 2.0 – The overlying mechanism for modeling,

- MOF QVT – QVT is specifically designed to handle data transformations,
- UML Profile for Testing. Defines a mechanism for defining a testing certification for a conversion map

#### 6.4 Related Activities, Documents and Standards

The proposal should reflect awareness and compatibility with the major standards activities on the payments arena including the ISTH harmonization group, SWIFT standards activities, IFX standards committee, TWIST standards activities, and Visa International's standards activities.

- ISO – A standards body that issues many standards in the payments area.  
[www.iso.org](http://www.iso.org)
- ISO 20022--A standard used in the finance industry which, among other things, defines a way to transform UML class models into XML schemas. The standard is under the jurisdiction of ISO TC 68 (Financial Services).  
[www.iso20022.org](http://www.iso20022.org)
- IST Harmonization—A consortium of IFX, SWIFT, TWIST, and OAGi that used ISO 20022 to define the next generation of electronic payment messages.  
<http://www.openapplications.org/wg/PaymentHarmonization/200311107-Gartner/Background.htm>
- IFX Forum—International Financial eXchange Forum, a financial standards organization that is a member of the IST Harmonization Group.  
[www.ifxforum.org](http://www.ifxforum.org)
- SWIFT—A banking standards cooperative that also runs a network for transactions involving banks and that is a member of the IST Harmonization Group.  
[www.swift.com](http://www.swift.com)
- OAGi—The Open Applications Group, a standards group for business software interoperability, which is a member of the IST Harmonization Group.  
[www.openapplications.org](http://www.openapplications.org)
- TWIST—Transaction Workflow Innovation Standards Team , a standards organization that specifies XML-based standards for financial markets, and which is a member of the IST Harmonization Group.  
[www.twiststandards.org](http://www.twiststandards.org)

- Visa International Service Association – A banking consortium involved in consumer and commercial payments through use of the Visa Payments system.

[www.visa.com](http://www.visa.com)

## 6.5 Mandatory Requirements

6.5.1 Proposals shall adapt or construct a common model of payment messages that is based on the IST Harmonization Group’s canonical “kernel” payment messages. The common model shall be an instance of a MOF-compatible metamodel. (See 0 for an explanation of the concept of a MOF-compatible metamodel.).

6.5.2 Proposals shall define transformations among the following payment message formats:

1. ISO XML (The IST Harmonization payment kernel)
2. TWIST payment messages
3. SWIFT FIN payment messages
4. IFX payment messages
5. ISO 8583 payment authorization messages
6. VisaNet TCR clearing transactions

In particular, for each of the above-listed message formats, proposals shall define the following two lossless conversion maps (see section 6.2.5 for details regarding lossless conversions):

1. A conversion map with the message format as the source and the common model as a target
2. A conversion map and with the message format as the target and the common model as the source (see section 6.2.4 for discussion of n-squared explosion)

- 6.5.3 Proposals shall define whatever MOF-compatible metamodels are needed in order to satisfy mandatory requirements 6.5.1 and 6.5.2 above (see section 0 above for a detailed explanation).
- 6.5.4 Proposals shall select or define a language for the procedural expressions that are included in the conversion maps and a library of conversion procedures. The language shall be an expression language, providing simple infix operators and the ability to call procedures through a defined API (see section 6.2.2 above for a detailed explanation).
- 6.5.5 Proposals shall specify an extensibility framework that supports extension of the specifications to cover additional payment message formats not enumerated in section 6.5.2. The framework shall support lossless transformations and include:
1. Patterns for defining lossless conversion maps
  2. A library of procedural expressions and/or a set of procedural expression patterns

The specification of the extensibility framework shall include complete instructions for architects who wish to use it, including an example that uses the extensibility framework to incorporate an additional message format. (See section 6.2.6 above for a detailed explanation regarding the extensibility framework).

- 6.5.6 Proposals shall define a testing methodology that can be used to certify that conversion components created based on a conversion map are consistent with that map.

## **6.6 Optional Requirements**

- 6.6.1 Proposals may define conversion maps that include additional payment message formats beyond those listed in mandatory requirement 6.5.2.
- 6.6.2 Proposal may include examples of mapping to a proprietary internal format such as a comma-delimited file with payment information.

Proposals may define a graphical syntax for displaying payment message conversion maps (see section 6.2.3 above for a detailed explanation).

## **6.7 Issues to be discussed**

Proposal shall discuss the mechanism and standards for efficiently handling of lossless conversions

Proposal shall discuss the reason for the choice of conversion specification technology

## **6.8 Evaluation Criteria**

The proposals will be judged on the following criteria:

1. How successful and comprehensive are the patterns and mechanisms for lossless transformation?
2. How simple and easy to use are the mapping methodology and patterns?
3. How extensible is the mapping methodology and patterns to other payment message formats, including internal payment message formats?
4. How effective is the testing and certification mechanism.

## **6.9 Other information unique to this RFP**

None

## **6.10 RFP Timetable**

The timetable for this RFP is given below. Note that the TF or its parent TC may, in certain circumstances, extend deadlines while the RFP is running, or may elect to have more than one Revised Submission step. The latest timetable can always be found at the *OMG Work In Progress* page at

<http://www.omg.org/schedules/> under the item identified by the name of this RFP. Note that “<month>” and “<approximate month>” is the name of the month spelled out; e.g., January.

<b>Event or Activity</b>	
<i>Preparation of RFP by TF</i>	<i>June 21, 2005</i>
<i>RFP placed on OMG document server</i>	<i>August 22, 2005</i>
<i>Approval of RFP by Architecture Board</i> <i>Review by TC</i>	
<i>TC votes to issue RFP</i>	<i>September 16, 2005</i>
<i>LOI to submit to RFP due</i>	<i>February 20, 2006</i>
<i>Initial Submissions due and placed on OMG document server (“Three week rule”)</i>	<i>April 23, 2006</i>
<i>Voter registration closes</i>	<i>May 1, 2006</i>
<i>Initial Submission presentations</i>	<i>April 25, 2006</i>
<i>Preliminary evaluation by TF</i>	<i>June 1, 2006</i>
<i>Revised Submissions due and placed on OMG document server (“Three week rule”)</i>	<i>June 5, 2006</i>
<i>Revised Submission presentations</i>	<i>June 27, 2006</i>
<i>Final evaluation and selection by TF</i> <i>Recommendation to AB and TC</i>	<i>September 26, 2006</i>
<i>Approval by Architecture Board</i> <i>Review by TC</i>	<i>September 28, 2006</i>
<i>TC votes to recommend specification</i>	<i>September 29, 2006</i>
<i>BoD votes to adopt specification</i>	<i>December 6, 2006</i>

## Appendix A      References and Glossary Specific to this RFP

### A.1      References Specific to this RFP

IFX -- *Interactive Financial eXchange Forum*, <http://www.ifxforum.org>

ISO 2002 ISO 20022 *UNIversal Financial Industry message scheme*,  
<http://www.iso20022.org>

ISTH -- *IST Harmonization World Wide Payment Harmonization Project: Backgrounder*,  
<http://www.openapplications.org/wg/PaymentHarmonization/200311107-Gartner/Background.htm>

OAGi -- *The Open Applications Group*, <http://www.openapplications.org>

SWIFT -- *SWIFT*, [www.swift.com](http://www.swift.com)

TWIST -- *Transaction Workflow Innovation Standards Team*,  
<http://www.twiststandards.org>

XMI 2.1 -- *XMI 2.1 Specification*, OMG Document ptc/04-06-07, June 2004

CWM 1.1 -- *Common Warehouse Metamodel, v1.1*, OMG Document formal/03-03-02

UML 2.0 – *UML Superstructure Specification, v2.0G Document*, formal/05-07-04

UML Profile for Testing -- *UML Profile for Testing*, OMG Document ptc/04-04-02

MOF 2.0 – *Meta object Facility 2.0*, OMG Document ptc/04-10-15

MOF QVT – *MOF Query, Views, Transformations*, OMG Document ad/04-04-01

## **A.2 Glossary Specific to this RFP**

Conversion Map – refers to the requested maps that define how to map data from one payment message format to another message format.

Pattern -- refers to a reusable model of a specific aspect of the conversion process; e.g., there may be a pattern for mapping information to an auxiliary source; for aggregating information from two sources into one target field; etc.

## **Appendix B General Reference and Glossary**