Message Control and Choreography – Single Business Document PIP Template

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1. Document Management

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Axway	Cisco
DHL	IBM
KJC Solutions	Oracle
OASIS	Software AG
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1.5 Related Documents

- MCC ebMS V2 Profile R11.00.00A
- MCC ebMS V3 Profile R11.00.00A
- MCC Web Services Profile R11.00.00A
- MCC AS2 Profile V11.00.00

1.6 Document Version History

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1.7 Document Purpose

The purpose of the document is to explain the structure, the association between objects, the content of objects and the definition for single elements to a non-technical audience.

2. Introduction

2.1 Motivation and Scope

The objective of the MCC Program is to provide consistent and well defined guidelines for enabling and managing business process choreography and control while performing RosettaNet Partner Interface Processes (PIPs) using multiple messaging services. In order to reduce maintenance burdens of RosettaNet partners, the envisioned messaging services must be industry accepted messaging technologies. At the time of writing, AS2, ebMS and Web Services are subject to specification by the MCC program, but profiles for further messaging technologies may be provided in the future.

The MCC approach is split up in two phases:

1. Phase 1 (this document and messaging technology profiles):
   Phase 1 is concerned with the execution of PIPs in a messaging technology specific way, i.e., the specification of how a PIP is to be performed using the messaging technologies named above. Note, that a mix-up of messaging technologies for performing a single PIP instance is not supported. Instead, the requirements for reusing PIP implementations as atomic building blocks in PIP compositions are to be investigated.
   A core requirement for the use of PIPs as atomic building blocks is strict mutual agreement with respect to PIP execution result. This concerns the success of business document and business signal exchanges as well as the state of these messages. Also, integration partners must achieve agreement with respect to QoS realization of each business document/signal exchanged. For example, authentication for a business document/signal message must be provided for the sender AND for the receiver of the business document/signal message. This means that simply attaching a signature at the business document/signal message is not sufficient. Instead, more advanced protocols for realizing mutuality of QoS properties must be applied.

2. Phase 2 (to be defined in separate documents):
   Phase 2 of the MCC program will define the requirements for modeling and performing PIP compositions (collaborations). Thereby, the deliverables of MCC phase 1 should be reused with minimal to no adaptations. Especially, it shall be possible to combine PIPs that employ different messaging technologies in one collaboration.
   The strict mutual agreement with respect to PIP execution of MCC phase 1 is needed for composition of PIPs in MCC phase 2. The composition of PIPs calls for defining the control flow of PIP executions. Control flow, in turn typically depends on the result of PIP executions. Consequently, if the result of PIP executions could change after having finished the PIP, the control flow logic would become much more complex. Situations leading to a change of a already performed PIP therefore have to be avoided such as, a PIP responder detecting that a business document was sent out-of-sequence, a PIP

responder detecting that the business document references non-existing items, or a PIP requester detecting that the signature of a ReceiptAcknowledgement is invalid.

The concept of separating the execution of a single PIP from the composition of PIPs immediately makes clear that the execution context of a PIP is not uniform. MCC distinguishes between three different execution contexts:

1. PIP execution without full support of composition requirements (in the following, ***"lax PIP execution"***):
   This execution contexts reflects the situation that a single PIP is sufficient for partner integration and reuse of the PIP implementation within PIP compositions is not intended. Therefore, the requirement of strict mutual agreement with respect to execution success, content and QoS realization of message exchanges may be relaxed to fit the needs of integration partners.

2. PIP execution with full support of composition requirements (in the following, ***"strict PIP execution"***):
   This execution context reflects the situation that a single PIP is ***not*** sufficient for partner integration and reuse of the PIP implementation within collaborations is intended in the future. Therefore, the means for achieving strict mutual agreement upon the PIP execution result must be provided.

The objectives of this document is to lay foundational work for a new definition of PIPs that relies on a generic definition of single business document PIPs from which more complex PIP compositions could be created in a flexible way. Such a composition would involve the definition of choreographies which is out of scope of this document. The new definition of single business document PIPs identifies the essential features of a Single Business Document PIP that are common to all instance of such PIPs. These features are defined in an abstract way – i.e. by emphasizing their intent – and keeps open different ways to implement them, as this may vary depending on the underlying messaging protocol.

This PIP definition also scopes the variability of PIP features, i.e. to what extent they can vary from one PIP to another, and how to control this variation (e.g. parameters). This will address the need for PIP customization, especially regarding QoS aspects.

The mode of execution of the PIP may also vary, in particular depending on the messaging protocol in use and the envisioned degree of coupling between integration systems.

2.2 Relation between MCC and MMS

The relation of MCC and MMS is discussed separately for MCC phase 1 and phase 2.

2.2.1 Relation between MCC phase 1 and MMS

MCC phase 1 and the MMS specification are very similar in scope. MMS specifies the exchange of one business document while MCC phase 1 deals with performing PIPs. Since RosettaNet has decided to support Single business document -PIPs only in the future the difference between MCC phase 1 and MMS is not about the number of business documents to be exchanged, but about the assumptions made about communicating partners as well as the requirements with respect to business document exchanges:

1. Requirements with respect to business document exchanges:
   The core difference between MCC phase 1 and MMS is strict mutual agreement with respect to PIP execution result (cf. above).

2. Assumptions made about communicating partners:
   MCC phase 1 considers that composition of PIPs (MCC phase 2) is inherently complex. Complexity concerns support for business process instances and relating business messages to these process instances, support for monitoring timing constraints as well as support for validation of business messages. This profile therefore assumes that a MCC capable integration partner provides an adequate system environment for providing these capabilities. In order to make this burden bearable, MCC phase 1 strives for the application of standard communication technologies (as does MMS).

2.2.2 Relation between MCC phase 2 and MMS

MCC phase 2 will require the choice of execution context 2 (strict PIP execution) for PIP implementations. As MMS does not reflect the characteristics of this execution context in full, MMS does not necessarily have to be supported as implementation option for PIPs. Integration partners may agree to use MMS though. In this case it's up to the integration partners to define means for dealing with the effects of using MMS on the choreography control.

3. Single Business Document PIP Definition and Requirements

The “Single business document Template” section defines a model for single business document PIPs that is aligned with ebBP Single business document BusinessTransactions. It is abstract in two different ways:

1. The realization of a PIP definition component may vary with the communication technology selected for implementing the PIP.

2. The realization of a PIP definition may vary depending on the execution context assumed.

Also, the template for Single Business Document PIP definition is general in the sense that the definition of a concrete PIP will select from the model components offered. Section “Execution Parameters and Configuration” therefore describes rules for defining a customized, or “concrete” PIP.

To summarize, there are four levels at which PIP material is defined:

(1) **PIP template**: This level defines the general structure – or model - of a PIP and the features that may be used in a particular PIP definition. This is the object of this document.

(2) **PIP definition**: This level defines particular PIPs usable for business exchanges. These will usually contain parameters that are left for users to define, e.g. via an agreement between members of a supply chain. A PIP definition is prescriptive and states the conditions for a PIP instance to be considered conforming to a PIP definition.

(3) **Customized PIP**: (or concrete PIP): At this level, all elements of a PIP are fully defined, and all parameters (such as QoS, timing) are given a specific value or specific range that is agreed between partners. The execution of such PIPs is determined in terms of QoS, alignment features and execution mode. The factors that condition a successful or a failed outcome are fully determined and known from partners.

(4) **PIP instance**: This is an image of a particular execution of a PIP, i.e. a particular sequence of concrete messages where all components and PIP properties are given a value – e.g. a fully defined business document between two identified partners, a particular timing between these messages, etc.

3.1 Single business document Template

The model for the Single Business Document PIP template that is aligned with ebBP single business document BusinessTransactions is a structure of five major components each one of which is in turn composed of several properties or features:

1. Parties involved.
2. Business Document.
3. Business State Alignment features.
4. PIP execution outcome
5. Quality of Service features.

Concretely defining the actual set of features in use within each of the above areas (e.g. QoS options, quantitative values, amounts to defining a **concrete PIP**. A concrete PIP may leave some of its aspects undefined, i.e. adjustable by users (e.g. timing parameter values). Other aspects that need to be defined when executing a PIP are not considered as part of the PIP definition, but rather defining its **execution mode** (see later).

3.1.1 Parties involved

- (a) the **PIP requester** party (or Requester), sending the Single Business Document message.
- (b) the **PIP responder** party (or Responder), receiving the Single Business Document message.

Properties that are associated with each party are:

- Requester role for the PIP (specific to a PIP definition).

- Responder role for the PIP (specific to a PIP definition)..

- party ID associated with each role (varies across instances of the same PIP definition)

3.1.2 Business Document

Represents the actual business content of the PIP as defined in RosettaNet business document definitions as well as additional collaterals, like drawings .

3.1.3 Business State Alignment features

The objective of these alignment features is to provide to each business party participating to a PIP, a common understanding about the status of the action message in terms of its reception, validity and processing prospects. Two features stand out:

- (1) **Delivery Alignment**: Gives the Requester party an assurance that the action message has been received by the Responder (eg. **Acknowledgement of Receipt**), or on the contrary that it has not been received (eg. **Notification of Reception Failure**). Semantic variants of this reception can be: (a) simple acknowledgement of reception by the messaging layer, (b) confirmation that the message has been delivered to the application layer.

NOTE: Some QoS capability such as reliable messaging may support this alignment feature. However proper relay to the business layer is required for this feature to be fulfilled.

- **(2) Validity Alignment**:
  Gives the Requester an assurance that the action message has been statically validated by the Responder's integration system (**Acknowledgement of Validity)** or on the contrary that it failed to validate (**Notification of Validation Failure**) .
  Different types of validation may be performed before aligning states about validity (e.g. before sending a ValidityAcknowledgement message, or by sending a validation failure notice). This template defines the following validation steps or levels:

  - **Syntax validation**, i.e., check whether the business document is a well-formed document.
  - **Type validation**, i.e., check whether the business document is valid according to a schema definition file.
  - **Business Rules validation**, i.e., check whether the business document is in line with a set of business rules that can be automatically checked without touching business applications.
  - **Sequence validation**, i.e., check whether this kind of business document is expected at the current state of the super-ordinate collaboration (applies only to execution context

  Additional steps

  - **Business entity dereferencing**, i.e., check whether the business entities defined in the business document can be resolved within the business application.
  - **Document completeness check**, i.e., check whether the business document is complete from a business perspective. This may concern

completeness of line items as defined in a business document of a prior PIP or as required by a business application.

- **Business application check**, i.e., the responder party must make sure that any validation checks have been applied to the action message that are necessary for ensuring processability of the business message.

- **Delegation to business application**, i.e., the business document has successfully been imported by the business application.

The actual meaning of validation depends on which subset of these above steps is required in a particular PIP definition, or required between agreement between partners (in case the PIP definition leaves some options open).

NOTE 1 in this “template” document, no firm prescription of what a partner MUST do or not do: Only PIP definitions – or partner-customized PIP definition - will be prescriptive about (a) the validation steps to be performed, (b) how the alignment must be performed (e.g. only for positive or negative cases or both).

NOTE 2: more advanced levels of acknowledgement, such as business acceptance, are considered as covered by PIP compositions or n-action PIPs. Such levels of acknowledgement cover issues like full business acceptance and guaranteed processing in a business sense. This will be covered by the exchange of another business document, for example, a PO confirmation in case of a PO Request as first action message. For this reason, these higher forms of acknowledgement are beyond the scope of this document. In other failure cases at processing level, alignment may be covered by separate, specialized PIPS.

3.1.4 PIP execution outcome

The state alignment features above will be used by the MCC messaging technology profiles to compute one of the following result values of a PIP execution (aligned with ebBP).

A Single Business Document PIP result is defined as a Protocol-outcome:

- **Protocol-outcome** is a label of value in {SUCCESS, FAILURE} where:
  - SUCCESS means: The PIP execution can be considered as fully conforming to the PIP definition or to the concrete PIP: alignment requirements, QoS requirements and other execution mode requirements have been satisfied.
  - FAILURE means: The PIP execution has been deficient in some way and violated some requirements in the PIP definition or the concrete PIP: alignment requirements, QoS requirements and other execution mode requirements, have not been observed.

NOTES:

- For an outcome of type FAILURE, it is expected that error handling will convey more details, including the ID of the PIP, precise cause of failure and message(s) at fault.

- Correct PIP outcome may not always be known from both sides immediately during or after the PIP execution. However it is expected that at some point in time acceptable to business, the outcome is fully shared between parties, even if done in a way independent from the PIP protocol (e.g. out of band communication between partners, log sharing, etc.)

3.1.5 Quality of Service features

NOTE: Some of these QoS relate more to the business-level service (e.g. as defined in an SLA), others are more relevant to the network layer. They are not distinguished here.
Further, for execution context 2 (strict PIP execution), QoS features MUST be implemented in a mutual way.

(1) Security options: these include the following features, along with related error handling:

- Authentication
- Confidentiality
- Integrity
- Non Repudiation/Non Repudiation Of Receipt,
- Authorization

(2) Reliable Messaging: these include the following features, along with related error handling:

- Guaranteed delivery (At-least-Once delivery)
- Duplicate elimination (At-Most-Once delivery)

(3) Timing Constraints: these include the following features, along with related error handling:

- **Time to acknowledge validity (or invalidity):**
  This is the maximum elapsed time from reception of the action message to notification of validity.
- **Time to Perform**:
  This is the maximum elapsed time from the initiation of the PIP to its completion, including any choreography pattern related to QoS.

4. PIP Parameterization and Execution Control

This section summarizes the parameters that control the features defined in the above abstract PIP model. Two sets of parameters will define a concrete PIP definition:

1. **PIP property parameters**: these are parameters that control the use of features defined above as PIP properties: level of state alignment and various QoS features. A concrete PIP definition may impose some values / settings for some, and leave some values open or within a range, for others. A default or recommended value may be suggested, with each concrete PIP definition.

2. **PIP execution parameters**: these are parameters that control the actual execution of the PIP. Most of these will be specific to the messaging solution in use, but some will be defined here independently from these messaging solutions. Indeed, such parameters may help harmonize a PIP usage across messaging solutions.

MCC requires the use of the ebBP format for declaring the configuration of a PIP. RosettaNet recommends the usage of the ebBP `DataExchange` business transaction type containing exactly one `RequestingBusinessActivity`.

4.1 PIP Property Parameters

The following parameters are configurable on a PIP definition and a PIP implementation instance basis:

Specification item	Configurable	Implication	Explanation
Send Request Document	no	-	A request document always has to be sent
Overall Time-To-Perform	yes	-	Time for performing the messaging technology specific PIP protocol.
ReceiptAcknowledgement	yes	-	Represents a ValidityAcknowledgement
Non-Repudiation	yes	-	--
Non-Repudiation-of-Receipt	yes	-	--
TimeToAcknowledgeReceipt	yes	Sending a ReceiptAcknowledgement	Time for sending a ValidityAcknowledgement measured from the receipt of the action message.
Reliability	yes	-	--
Confidentiality	yes	-	--
Integrity	yes	-	--
Authentication	yes	-	--
Authorization	yes	-	--
IntelligibleCheckRequired	yes	Sending a ReceiptAcknowledgement	Integration partners have to define the additional validation steps that have to be performed in case this flag is used.
RetryCount	yes	-	Describes how often a business document/signal is to be resent at the PIP process level.

Examples for defining PIPs will be given in the use cases section.

4.2 PIP execution modes and related parameters

PIP execution modes are defined at high level by the following general parameters. More detailed and complete definition will depend on the specifics of a messaging solution.

Messaging Protocols (see Section about "Messaging Options"). Indicates which messaging protocol is used. Typically: AS2 or AS4, ebMS V2 or V3, and Web Services complying with WS-I profiles. Details on how each one of these protocols must support the PIP property parameter values as well as the various alignment and QoS requirements of a particular PIP definition will be described in an adjunct MCC profiling document proper to this messaging solution.

Message Exchange Patterns: These are usually conditioned by connectivity constraints. These exchange patterns may affect the way QoS is achieved as well as state alignment. Three MEPs are defined here that are expected to cover most execution cases, but are not exclusive of others. Some may only be applicable to some transport protocols. These MEPs are however defined abstractly from these transports while defining some invariant properties across these transports:

- **Synchronous execution** (requester-initiated): the action message is pushed from the requester to the responder party, while any form of receipt (implementing some state alignment feature) is sent back over the same connection synchronously. This MEP only applies for request-response transports such as HTTP, where Receipts can be sent over the response leg.

- **Asynchronous execution with callback** (requester-initiated): the action message is pushed from the requester to the responder party, while any form of receipt (implementing some state alignment feature) is sent back as a callback asynchronously on a different connection. This MEP is appropriate when the timing for producing the receipt prohibits using the same connection. **Invariants**: This MEP assumes addressability of both Requester and Responder, and readiness to receive incoming messages.

- **Asynchronous execution** with **pulling** (requester-initiated): the action message is pushed from the requester to the responder party, while any form of receipt (implementing some state alignment feature is sent back asynchronously as result of a later message pull from the Requester. This MEP is appropriate when the timing for producing the receipt prohibits using the same connection and the initiator (requester) is not addressable. **Invariants**: This MEP assumes that the Requester takes the initiative of receiving the Receipt: it is using a request-response exchange (with Receipt over the response) for request-response transports such as HTTP. For another non-request-response protocol such as email, the Receipt may be pushed first (e.g. SMTP) to some intermediate store, then pulled by the requester (e.g. using a client protocol such as IMAP).

4.3 PIP Instance Correlation and Identification

4.3.1 PIP Identification

Generation of Globally Unique Ids (GUIDs) for PIP instances

PIP instance ids are to be generated by the PIP requester by appending an id that is unique within her systems to her globally unique partner id, preferably a GLN or a DUNS number.

Inclusion of PIP instance GUIDs within RosettaNet message definitions

- For RNIF 1.1 based business documents
  <ServiceHeader><ProcessControl><ProcessIdentity><InstanceIdentifier>.
- For RNIF 2.0 based business documents
  <ServiceHeader><ProcessControl><pipInstanceId><InstanceIdentifier>.
- For ReceiptAcknowledgements (Shall we use ebBP signal definitions?)
  ReceiptAcknowledgement.CollaborationIdentifier

While the details of PIP execution are to be defined in the MCC messaging technology profiles there are some common characteristics to all messaging technologies.

4.3.2 Message Correlation

Message correlation denotes the act of associating messages with process instances which may be implemented at the messaging level or at the PIP process level.

Message correlation at the PIP process level defines message correlation in terms of PIP business document content and business signal headers.

Message correlation at the messaging level leverages the intrinsic correlation features of the messaging technology: the profiling of each one of the messaging solutions for PIPs will specify how correlation is achieved,

Even when message correlation is ensured at process level, it should be reflected at messaging level when the protocol allows, for supporting features such as monitoring and other quality of service aspects.

5. Use Cases of PIP definition

This section gives some sample configurations of PIPs according to the configurability matrix above. The MCC messaging technology profiles are expected to describe the implementation of these use cases.

5.1 Use Case 1 – Full features

```
<DataExchange
    name="bt-PIP3A20"
    nameID="bt-PIP3A20"
    isGuaranteedDeliveryRequired="true">
    <RequestingRole name="Purchase Order Confirmation Sender" nameID="bt-
PIP3A20-role-sender"/>
    <RespondingRole name="Purchase Order Confirmation Receiver" nameID="bt-
PIP3A20-role-receiver"/>
    <RequestingBusinessActivity
        name="Send Purchase Order Confirmation"
        nameID="bt-PIP3A20-ba-req"
        isIntelligibleCheckRequired="true"
        isNonRepudiationRequired="true"
        isNonRepudiationReceiptRequired="true"
        retryCount="3"
        timeToAcknowledgeReceipt="PT3M"
        >
        <DocumentEnvelope
           name="doc-PIP3A20-PurchaseOrderConfirmation"
           businessDocumentRef="doc-PIP3A20-PurchaseOrderConfirmation"
           nameID="doc-PIP3A20-PurchaseOrderConfirmation-de"
           isAuthenticated="transient"
           isConfidential="transient"
           isTamperDetectable="transient"
           />
        <ReceiptAcknowledgement
           name="ra"
           nameID="bt-PIP3A20-ack-ra"
           signalDefinitionRef="ra2"/>
        <ReceiptAcknowledgementException
           name="rae"
           nameID="bt-PIP3A20-ack-rae"
           signalDefinitionRef="rae2"/>
    </RequestingBusinessActivity>
    <RespondingBusinessActivity name="xsd-pacifier" nameID="bt-PIP3A20-
ba-resp"/>
</DataExchange>
```


5.2 Use Case 2 – Business Document Only

```
<DataExchange
      name="bt-PIP3A20"
      nameID="bt-PIP3A20"
      isGuaranteedDeliveryRequired="true">
      <RequestingRole name="Purchase Order Confirmation Sender"
nameID="bt-PIP3A20-role-sender"/>
      <RespondingRole name="Purchase Order Confirmation Receiver"
nameID="bt-PIP3A20-role-receiver"/>
      <!-- No TTAR, nor isIntelligibleCheckRequired -->
      <RequestingBusinessActivity
            name="Send Purchase Order Confirmation"
            nameID="bt-PIP3A20-ba-req"
            isNonRepudiationRequired="true"
            isNonRepudiationReceiptRequired="true"
            retryCount="1"
            >
            <DocumentEnvelope
                  name="doc-PIP3A20-PurchaseOrderConfirmation"
                  businessDocumentRef="doc-PIP3A20-
PurchaseOrderConfirmation"
                  nameID="doc-PIP3A20-PurchaseOrderConfirmation-de"
                  isAuthenticated="transient"
                  isConfidential="transient"
                  isTamperDetectable="transient"
                  />
      <!-- No ReceiptAcknowledgement/Exception definitions here -->
      </RequestingBusinessActivity>
      <RespondingBusinessActivity name="xsd-pacifier" nameID="bt-
PIP3A20-ba-resp"/>
</DataExchange>
```

