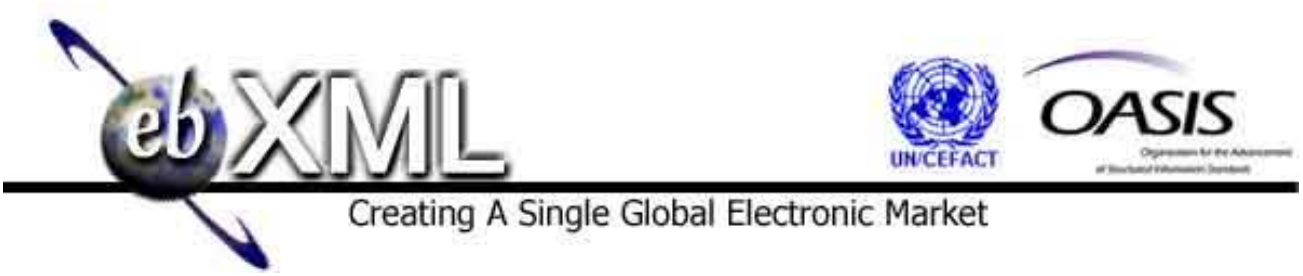

Negotiation Requirements

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Preface

This document contains the requirements for a specification of the CPA negotiation process.

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1 Goals

1.1 Long-range Goals

The goals of this project are to develop a specification for an automated negotiation process. This is a key step not only towards spontaneous e-commerce but also for established relationships (for example, an organization with thousands of partners). The focus is on negotiating long-term partner relationships as well as spontaneous relationships.

The negotiation process will be helpful for maintaining partner relationships, especially if an organization has a large number (perhaps thousands) of partners. Automated negotiation reduces the need for manual intervention, thereby simplifying life-cycle management of CPAs including both creation of initial CPAs and renewal and modification of existing CPAs. Potentially, this leads to significant cost reduction when there is a large number of partners.

While the initial goal is negotiating of a CPA, a long-term goal is to extend the negotiation process to include negotiation of higher-level aspects of an agreement such as business parameters and legal matters. The team should focus on the initial goal but keep higher level aspects in mind so that the approaches chosen for CPA negotiation might later be extendible to higher-level functions.

Another of goal is to extend the work to be applicable to Web Services. This goal is part of the CPPA team's OASIS charter. Proposals for function applicable to Web Services could be submitted as contributions to W3C. At this time, Web Services has no concept of electronic agreements. Therefore, the goal of contributing to Web Services is a long-range goal.

Another possible application is negotiation of electronic service-level agreements should an electronic service-level agreement be defined.

Consumers of the specification are developers of CPA composition and negotiation tools, users of ebXML-based systems, and users of Web Services.

1.2 High-Level Requirements for Version 1

The initial goal is to develop a specification for an automated negotiation process whose purpose is the composition/negotiation of a Collaboration Protocol Agreement (CPA) from the Collaboration Protocol Profiles (CPPs) of two prospective trading partners or from one partner's CPA template. This negotiation process may be viewed as an extension of an automated CPA-composition tool that incorporates human representatives of the prospective trading partners into the CPA-composition process.

We should start with a fairly simple specification that will enable creation of an early prototype.

Following are details of the requirements.

- Partner discovery

- Partner discovery is not in scope. The negotiation process starts with two prospective partners' CPPs or a CPA template.
- We will need to determine whether the negotiation process would impose some requirements on the discovery process or whether a commonly used discovery process might impose requirements on the negotiation process.

- Bootstrap of negotiation process
  - The negotiation process must be able to be executed without the negotiation process itself having to be negotiated. We will therefore need a minimalist approach to the message exchange for negotiation. Possibly, the bootstrap process can be built on WSDL and SOAP. The team should also review what the Registry team has created as its bootstrap process. Initially, the team will focus on what to negotiate and how to negotiate it, leaving the specific bootstrap process for later.

    NOTE: "Pure" SOAP at this time has no security functions. However, security can be provided by signing the CPPs, NDDs, and CPA and by using SSL for transport security. Only authentication is missing.
  - See also Sect. 2.8.1 , "Bootstrapping the negotiation process".
- Automated composition from two CPPs
- Automated composition of a CPA from a CPA template
  - A CPA template is a CPA that is written by one party for a business relationship with a second party. It will generally be used when one party is dominant and dictates most of the terms and conditions. In general, the party that creates the CPA template is proposing a "take it or leave it" relationship, with respect to its own properties, with the other party. The CPA template contains a complete description of the required properties of the other party except for information as PartyId, endpoint addresses, and perhaps a small number of other variables such as whether SSL client-side authentication is to be used. The creator of the CPA template could fix the value of **CPAId** by generating a GUID when it creates an instance of its CPA template.
  - Assuming that the CPA template belongs to a service provider, we need to define the service consumer's input to the composition process
- Negotiation process
  - Start with a high level description, perhaps in UML or in simple flow charts and bullets.
  - Then compose BPSS instance document.
    - NOTE: THE BPSS specification includes production rules for generating the XML from a UML model.
  - Definition of the messaging needed to support negotiation is included.
- Decide which negotiation functions must be normative.
  - Anything that involves interoperability
- Regarding composition/negotiation of a CPA from "basic" CPPs, can we identify some criteria that, if met by both CPPs, allow a CPA to be derived without difficulty? Could we develop some kind of rating of difficulty of composing/negotiating the CPA?
  - Evaluating the complexity of a counterproposal (in the negotiation) is important.
  - The specification should identify what should be (or not be) in a CPP to facilitate (simplify) the negotiation. Examples: Provide multiple options for some elements, specify ranges for numeric parameters.
- Prospective trading partners must agree on the same negotiation business process (if more

than one exist).

- NOTE: These negotiation processes are NOT the business processes that the CPP identifies under the CollaborationRole element. They are a separate list of negotiation processes.
- This relates to the bootstrap issue and therefore, to a later phase of the creation of version 1. See also section 2.8.1, "Bootstrapping the negotiation process".

- The CPP could specify whether or not its owner is willing to negotiate details of a CPA.
  - An element or attribute indicates "negotiable", includes a list of one or more negotiation processes that the owner is willing to use, and indicates whether 2-party or 3-party negotiation is desired.
  - This list would be used in the process of initializing the negotiation. The negotiation processes could be listed in decreasing order of preference, thus enabling two parties to quickly initialize to use the highest priority negotiation process that both are willing to perform.
  - The SOAP mustUnderstand and fault functions may be useful in implementing selection of a negotiation process.
    - A party could use a SOAP fault to indicate that it does not understand the proposed negotiation process.

2 Negotiation Elements

2.1 Purpose of Automated Negotiation

- Automate many of the tasks of negotiation of the contents of a CPA.
  - ♦ Negotiation of variables in composition of CPA from two CPPs
- The human will still be in the loop since the negotiation algorithm may not be capable of evaluating and deciding to accept or reject some proposals or counterproposals. The algorithm should decide when it is necessary to consult a human.

2.2 Partner Profiles

- A profile is a CPP with, perhaps additional information about the company that is out of scope of this or other CPPA team activities.
- Profiles can be placed in public repositories
  - ♦ ebXML Registry or UDDI registry.

2.3 Negotiation Descriptor Document

- A Negotiation Descriptor Document (NDD) describes what is negotiable in the CPP or CPA template.
  - ♦ Each party's NDD identifies the CPP and describes what is negotiable.
  - ♦ For a CPA template, there is a single NDD, provided by the creator of the CPA template. It describes what a second party is permitted to alter in the parts of the CPA that pertain to the second party, such as endpoint addresses and certificates.
- The NDD identifies the CPP or CPA template. The CPP or CPA template does not identify the NDD since a party may have many different NDDs associated with the same CPP or CPA template. These could be for different negotiation processes, different categories of partner, etc.
- The NDDs are exchanged at the start of negotiation.
- An NDD might be placed in a registry to be found when discovering the CPP. Since the CPP does not identify an NDD, there would have to be registry metadata to connect the CPP and NDD. However, it is expected that in general, NDDs will not be placed in a registry. Instead, a party will discover a potential trading partner's CPP. The two parties will then exchange NDDs at the beginning of the negotiation process.

2.4 Negotiation Messages

The negotiation protocol will consist of exchanges of messages that contain the details of offers and counter offers. The specification will define the schema and semantics of each message.

2.5 Automation of CPA Life Cycle

- Discovery is out of scope for V 1.
- Approaches

- Automated composition of initial CPA from the two CPPs
  - See [CPPCPA-F]
- Negotiation based on a CPA template supplied by one partner or some third party such as a negotiation service.
  - Other partner fills in its PartyInfo details and may suggest changes
- Negotiation of CPA details between partners
- Build CPA from CPPs or CPA template and negotiation results
- Deploy negotiated CPA at partner sites
- Do business

2.6 Assessment of Likelihood of Success

- Specification should state some preconditions for composition followed by negotiation
  - Minimum level of compatibility necessary to achieve a match after reasonable negotiation.
  - Possibilities for simplification. Examples:
    - Reasonably matched delivery channels
    - Rules for how to select from multiple possibilities that are supported by both parties
  - Indicate "no go" if the CPPs are too mismatched
- Provide guidelines for the structure and content of the initial CPA created by the composition process.

2.7 Automated Composition of CPA from two CPPs

- Update (improve) existing automated composition appendix in CPP-CPA spec.
- Move automated composition appendix from CPP-CPA specification to negotiation specification, make some material normative.

2.8 Automated Negotiation Process

- Automated CPA negotiation is a business process
  - Start by defining one such process; eventually there might be more than one such process
  - Automated negotiation is neither required nor prohibited
  - The CPP indicates that the party is willing to negotiate, what negotiation processes it uses, and whether it prefers 2-party negotiation or a third-party negotiation service.
    NOTE: This information cannot be in the NDD since different NDDs might be required for the different negotiation processes and for 2-party or 3-party negotiation.
    - Is there a bootstrap problem because this information is embedded in the CPP?
- Controlled by a negotiation CPA (NCPA)
  - Between partners
  - Between each partner and a negotiation service
  - This relates to the bootstrap issues. See also sect. 2.8.1, "Bootstrapping the negotiation process".
- Consider a layered approach such as that in the CPP-CPA composition appendix.

2.8.1 Bootstrapping the negotiation process

- Avoid a complex process of negotiation of the NCPA before negotiating the CPA.
  - The NCPA should not have to be negotiated. It should describe a minimal configuration that all parties can support.
    - The NCPA might be a "virtual" CPA, just a set of simple rules in the specification.
  - The bootstrap process could be predefined in middleware in all parties, so that it can always run without a configuration process.
  - If bootstrap is based on SOAP, add a SOAPBinding element to the delivery channel as an alternative to the EBXMLBinding element.
    - In an NCPA, any choices within the SOAPBinding element would be defined such that any party can send and receive messages without having to negotiate details with other parties.
  - Provide one or a very small number of NCPAs with each negotiation BPSS instance document.
    - Provide multiple NCPAs only if it is not possible for all parties to agree on the same configuration description.
  - The bootstrap process involves
    - Exchange of CPPs and NDDs (or one party sends a CPA template and an NDD to the other party).
    - Selection of an NCPA (see below) and installing it at both parties.
  - The pre-negotiation process should preferably consist simply of agreeing on which negotiation process and which of its NCPAs to use.
    - There should be no, or very few choices to be made among the CPA elements in the NCPA.
  - Using a synchronous response to a proposed CPA doesn't even requiring knowing a response URL.

2.8.2 Negotiation involving a negotiation service

- Is third party service in scope for V 1?
  - Probably not if it requires a different BPSS instance from the two-party case.
  - We probably first need to make progress in defining the two-party case in order to understand how negotiation works.
  - Consider it for a later phase of developing V1 or beyond V1.
- Decide on purpose of using a third-party negotiation service
  - Adversarial situations
    - The third party service enables a partner to give negotiation information to the third party that it might not want to reveal directly to the other party. For third-party negotiation, the NDDs would be given only to the negotiation service and not exchanged between partners.
- Negotiation service might be a web service accessed via UDDI/WSDL/SOAP. Such a service could choose between:
  - Dynamic service that supports spontaneous eCommerce by automatically composing, negotiating, and activating the CPA at each Party
  - Somewhat less spontaneous process in which the negotiation service provider takes two CPPs (or references to them), constructs a CPA, and offers it to the two parties via a

SubmitProposedCPA service port supported by each party. The SubmitProposedCPA service invocation would the start of a negotiation process that involves negotiation function at each party including possible human intervention.

- ♦ More manual process that negotiates with the aid of human input

2.8.3 Direct Negotiation between two Parties

- One party composes a CPA with certain terms
  - ♦ Including indicating specific items that are non-negotiable
- Sends CPA to other party for consideration
- Other party can
  - ♦ Reject and propose changes
  - ♦ Accept for automated install
  - ♦ Accept for manual install
- Iterate over negotiation until complete
  - ♦ Offer-counter-offer
  - ♦ Etc…

2.9 Negotiable items in CPP

The negotiable items in the CPP fall into the following categories:

- Numeric values: The initial value stated in the CPP can be any valid value that can be used without negotiation.
- Alternatives: The CPP contains all acceptable alternatives for a particular element in preference order. The CPP composition process will select the highest-preference item that is common to both CPPs.

  NOTE: The CPP-CPA specification already prescribes preference order for some elements and will have to be extended to prescribe preference order everywhere this is appropriate.

Following are some items of negotiation information that might be defined.

- Indications of what is negotiable.
- Numeric values such as number of retries
  - ♦ Indicate acceptable minimum and maximum values
  - ♦ Step sizes to be used in offer and counter-offer messages.

    NOTE: There are very few numeric values in the CPP at this time; extension to the application domain would add more numeric values (e.g. prices).

- More complex relationships between parameters. Variation of delivery channel details is an example.
- Agreement on certificate authorities (i.e. which are acceptable?)
  - ♦ More work is needed in the CPP-CPA specification in the areas of PKI and chain of trust.
  - ♦ Part of this relates to whether self-signed certificates will be allowed. If so, the negotiation process should include negotiating over whether self-signed certificates are

acceptable to the two parties.

- Version 1.1 of the CPP-CPA specification will include a set of trust anchors. If two parties' sets of trust anchors are incompatible, one could ask the other to add an additional trust anchor in order to achieve compatibility. The specification should cover the person to person aspects of negotiation.

- Delivery channels
  - Can't prioritize delivery channels as such since can have lots of combinations and delivery channels can be reused
  - Instead, the same business process can be offered with alternative DeliveryChannel elements, using multiple ActionBinding elements that can be listed in order of preference.

    NOTE: The details of this depend on the resolution of the ActionBinding proposal that is being discussed in the CPPA team.

2.10 Negotiation Progress Indicator

- The Status element in the CPA can be used as a negotiation progress indicator.
  - Value is an enumeration of `proposed`, `agreed`, and `signed.`
  - Additional values could be added, if needed, to express states prior to `agreed` with finer granularity. However it may be better to express such states, if needed, within the messages exchanged during the negotiation process.

2.11 Basic Components of Negotiation

See "Negotiation involving a negotiation service", above, for a simple web-service approach.

- Define negotiation protocol as a business process
  - Negotiation patterns
  - Negotiation verbs as business transactions
  - Possibly different variants such as for ebXML messaging and for SMTP, assuming that the Process Specification document would be different for these variants.
  - BP team has already done some work. See [ECOMMPATT].
  - Duane Nickull (XML Global) distributed a proposal[NICKULL] in Feb. 2001 that has been posted to the Negotiation listserver.
- NCPA
  - Ordinary CPA for the negotiation process
    - Points to negotiation business process (Process Specification Document)
    - Controls negotiation process between prospective trading partners
    - All negotiation-specific definitions (e.g. negotiation verbs and flows) should be in Process Specification document.

    NOTE: When a party discovers an NCPA in a registry or receives one from a potential trading partner, the NCPA is actually a CPA template. The party that discovers or receives one must fill in minimal information, such as its endpoint address, before it can be used to control the negotiation process.
  - Which party can initially propose an NCPA?
    - The party whose CPP is discovered in the registry?

- The party who discovers the CPP of a potential busines partner?
- Either party?

"Either party" is probably the right answer. However there is a potential race condition in which each proposes a different NCPA. If "either party" is accepted as the answer, the negotiation specification will have to include a protocol for NCPA acceptance that resolves the race condition.

- Open questions to consider
  - Can **CPAId** be a fixed value for all NCPAs? Probably not because it has to be unique among all CPAs concurrently installed or in use by the same partners at the same time. Conceivably, an NCPA-generating tool could generate a unique **CPAId** for each NCPA.
  - Can **partyId**s have fixed values in all NCPAs? Probably not since the MSH might be using **partyId** as part of its message-routing information.
- See also section 2.8.1, "Bootstrapping the negotiation process".

- Negotiation Descriptor Document (NDD)
  - Describes what is negotiable: ranges of parameters and prioritization of choices in a CPP or CPA template.
  - Written to go with a particular CPP or CPA template since it describes choices etc. in that particular CPP or CPA template.
- Two parties' CPPs or one party's CPA template
- Proposed Process-Specification document (BPSS instance document) under which the two parties will do business.
  - Prospective trading partners must agree on this before much more negotiation is done
    - Agree on which Process-Specification (BPSS instance) document will be used
    - Agree on some modifiable attribute values within it (e.g. security attribute values). The attribute values are modified by setting the values of the correspond override attributes in the CPA.

      NOTE: Modification of the BPSS instance document itself is out of scope for version 1.

2.12 Negotiation Configurations

- One on one between prospective trading partners
  - Negotiation CPA between the prospective trading partners
- Negotiation intermediary
  - Each prospective trading partner has a negotiation CPA with the intermediary
  - The negotiation intermediary plays an active role in the negotiation. It is NOT just a message-forwarding intermediary. It may function like a broker. Each party may tell it things that are not to be told to the other party. Examples are upper and lower limits of negotiable values, what a party is really in the market for.
  - A CPA template may or may not be useful with a negotiation intermediary since with a CPA template, one party dictates most of the terms and conditions and the modifiable items are few and simple. On the other hand, use of a CPA template with an intermediary is not excluded.

3 Requirements Related to Implementation

This section is to be determined. It might actually consist of requirements that avoid constraining implementations unnecessarily.

4 Deliverables

- Specification of the negotiation process
  - UML activity diagram or equivalent graphical representation
  - Definition of negotiation verbs
  - Message envelope structure
  - Message schema
  - Autonegotiation BPSS instance document (choreography)
  - NDD schema
  - Specification of the NCPA. This would identify the minimal CPA contents needed to enable the negotiation process without having to negotiate the NCPA beyond supplying endpoint addresses.
- Sample NCPA
- Sample NDD
- SOAP binding for using vanilla SOAP for message exchange
- Possible additions to or revisions of the appendix on composition of a CPA from two CPPs that is in the CPP-CPA specification.
  - Consider moving that appendix to the negotiation specification or publishing it separately.
- Tutorial for implementers
- Best-practices document if appropriate

5 Subjects for Future Versions

The following subjects appear to be out of scope for Version 1 but might be considered for future versions.

5.1.1 Negotiating Delivery Channels

- May want to provide for negotiating new delivery channels, i.e. new combinations of the Transport and DocExchange elements that are in the CPPs.
  - ♦ This would involve dynamic reconfiguration of the server, which may or may not be possible. If reconfiguration is possible, it may involve software changes, etc., in order to accommodate the change.

5.1.2 Interrelations Between Different Numeric Parameters

- One commenter suggested an example of interrelation between price ranges and quantity ranges. This example is only applicable if and when the team includes business-level quantities in the negotiation process.

5.1.3 Alternative Specifications of Collaborative Protocol

- Future versions of the specification could support alternative forms of specifying either the negotation collaboration or the business collaboration protocol that the parties will execute in addition to BPSS. One possibility is the collaboration protocol used with Web services.

5.1.4 Direct Modification of BPSS Instance Document

- Direct modification of the BPSS instance document could be supported as part of the negotiation process if the BPSS team defines how to do it.

5.1.5 Negotiation Intermediary

- Consider the case where one or both parties don't want their identities known to the other party during the course of negotiation.

6 Glossary

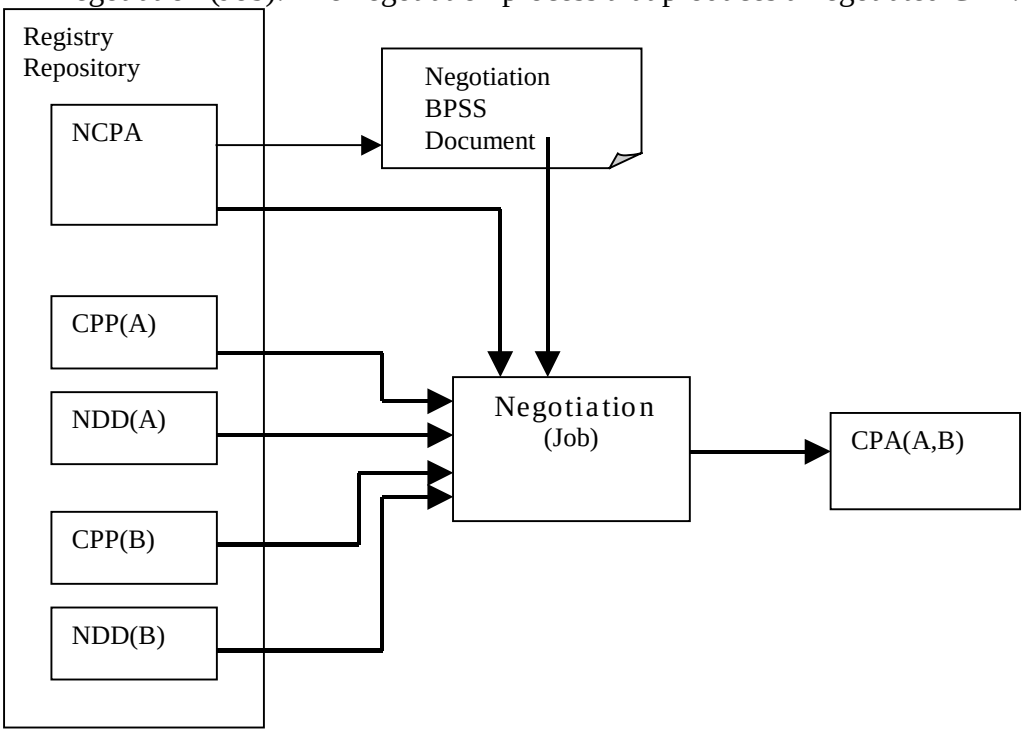
This section is to be written. It should later be included in the specification.

7 Material that may be Useful in writing an introduction to the specifcation

The following overview of CPA negotiation was contributed by Yukinori Saito. The illustrated process negotiates a CPA from two CPPs. This material will need revision based on the final content of the specification.

Following are the definitions of terms. These are discussed in more detail in the rest of this document.

- NCPA: A negotiation CPA that controls the negotiation process.
- Negotiation BPSS Document: defines the negotiation collaborative protocol.
- NDD: a document associated with the CPP that defines what is negotiable, ranges of numeric values, etc.
- Negotiation (Job): The negotiation process that produces a negotiated CPA.



8 References

[CPPCPA] Collaboration-Protocol Profile and Agreement Specification, Version 1.0

[CPPCPA-F] Appendix F, "Composing a CPA from Two CPPs", of [CPPCPA] discusses technical issues for a CPP-CPA composition tool.

[ECOMMPATT] ebXML E-Commerce Patterns v1.0 technical report. This report includes chapters on contract-formation and automated contract-negotiation patterns for ebXML.

[NICKULL] ebXML Automatic CPA Negotiation, 14 February 2001 (not published).