

CONFIGURING ELECTRONIC RELATIONSHIP AMONG THE IHE
ACTORS' BUSINESS SERVICE INTERFACES THROUGH EXML
COLLABORATION PROTOCOL PROFILE AND AGREEMENT IN A
VIRTUAL CONNECTATHON ENVIRONMENT

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ABSTRACT

CONFIGURING ELECTRONIC RELATIONSHIP AMONG THE IHE
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Today, the healthcare IT vendors develop interfaces for their products to comply with the IHE Profiles and test them with other vendors in annual events, called IHE Connectathons which are one week events organized to perform interoperability testing. Network configuration including hostnames, IP addresses, port numbers for healthcare services and URLs for the various web services used in IHE profiles are stored on online databases accessible from the IHE website. When all companies register for participation to the connectathon, a default configuration is created in the database, assigning default values for healthcare service specific parameters. Afterwards, a company is expected to use the configuration parameters from that database during the connectathon. Except from the connectathons, the vendors could not test their products with other vendors'.

In this thesis, research on IHE Configuration Management Tool based on

IHE profiles, ebXML ebBP, CPP and CPA specifications is presented. The intention behind developing such a tool is to automate the creation and exchange of configuration information between IHE Actors in a Virtual Connectathon Portal. The results of this research enable the IHE product vendors to test their products in interactions with other vendors through the web anytime/anywhere by automatic business service interface configuration. The research enables the healthcare systems to engage with many trading partners at the same time automatically.

The work presented in this thesis is realized as a part of IST-027065 RIDE project funded by European Commission.

Keywords: IHE Profiles, Connectathon, ebXML CPP and CPA, Business Service Interface, Configuration

ÖZ

YAPAY KONNEKTATON ORTAMINDA EBXML İŞ BİRLİĞİ PROTOKOLÜ PROFİLİ VE ANLAŞMASI İLE IHE AKTÖRLERİNİN İŞ SERVİS ARAYÜZLERİ ARASINDAKİ ELEKTRONİK İLİŞKİNİN YAPILANDIRILMASI

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Günümüz sağlık servisleri sağlayıcıları IHE profillerine uygun ürünlerini diğer sağlayıcıların ürünleri ile test edebilmek için her yıl düzenlenen Konnektaton adlı toplantılara katılmaktadırlar. IHE profillerinde kullanılan sağlık hizmetleri servis sağlayıcılarının sistem adı, IP adresi, port numarası ve çeşitli web servislerin URLleri gibi ağ yapılandırma bilgisi, konnektaton katılımcılarının IHE web sitesinden ulaşabilecekleri çevrimiçi veritabanlarında tutulmaktadır. Tüm şirketler konnektatona katılım için kayıt olduklarında, IHE veri tabanında varsayılan yapılandırma oluşturulmakta ve varsayılan sağlık hizmetlerine özgü parametreler atanmaktadır. Sonra herkesin kabul edilen yapılandırma parametrelerini konnektaton sırasında veritabanından alarak kullanmaları beklenmektedir. Konnektatonlar dışında, servis sağlayıcılar kendi ürünlerini diğer servis sağlayıcıların ürünleriyle test edememektedir.

Bu tezde, IHE profilleri, OASIS ebXML ebBP, CPP ve CPA spesifikasyon-

ları tabanlı IHE Yapılandırma Yönetim Aracı araştırması sunulmaktadır. Böyle bir araç geliştirmedeki amaç, yapay konnektatın portalında katılımcı olan IHE Aktörlerinin yapılandırma bilgisi oluşturmalarını ve değiş-tokuşunu otomatik hale getirmektir. Bu araştırma ve geliştirilen araç, IHE ürün sağlayıcılarının ürünlerini her zaman her yerde web üzerinden diğer IHE servis sağlayıcıları ile etkileşim içinde test etmelerine olanak sağlamaktadır. Bu araştırma sayesinde sağlık sistemlerinin bir çok iş ortağı ile aynı anda otomatik olarak iletişim kurabilmeleri sağlanmaktadır.

Bu çalışma Avrupa Komisyonu tarafından desteklenen IST-027065 RIDE projesinin bir parçası olarak gerçekleştirilmiştir.

Anahtar Kelimeler: IHE Profilleri, Konnektatın, ebXML CPP ve CPA, İş Servisi Arayüzü, Yapılandırma

To my family

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CHAPTER 1

Introduction

Healthcare domain consists of diverse foundations, associations and institutes such as government hospitals, university hospitals, special branch hospitals and clinics. There exist complex work flows among the entities in the healthcare domain. Following the advancements in the area of information and communication technologies, more and more health professionals and community workers are now using electronic healthcare systems to share information and connect to health services. The delivery and management of healthcare through electronic infrastructures have extended beyond a single hospital or medical professional's office and have resulted in healthcare information being distributed in a very complex clew-like computer networks.

Today, we have access to technology that seems limitless in its potential to fulfill aspirations for eHealth era. In eHealth area, healthcare information system networks over the internet play primary and essential roles in helping people about a range of health care issues, such as: basic information about health conditions and treatment options and electronic health record storage and retrieval.

In order to address interoperability of eHealth systems, "Integrating the Healthcare Enterprise" (IHE)[1][2] initiative provides integration profiles for vendors/users representing eHealth process scenarios within a detailed technical

framework. IHE is a standards-based integration process that works to improve the way computer systems in healthcare share information. Through integration profiles, IHE organizes a set of coordinated, standards-based transactions between a subset of the functional components of health organizations in order to address a specific clinical or infrastructure need. IHE provides a detailed implementation and testing process to promote the adoption of standards-based interoperability by vendors and users of healthcare information systems. The process culminates in the Connectathon(Connectivity-Marathon), a week long interoperability-testing event. The Connectathon provides the most detailed validation of the participants' integration work. Participating companies prepare for the event using testing software developed for this purpose.

Before IHE actors perform transactions in IHE health scenarios, healthcare information systems of the actors should be set up and ready for communication. To help starting this complex communication in the network of healthcare systems, at the very first and base level, focus should be on providing healthcare information systems with complete and relevant configuration information to enable them contribute to the health information flow by participating in health networks properly and easily. During the current connectathon events, systems are manually configured to exchange information with complementary systems.

The Virtual Connectathon Portal (VCP)[3] provides a platform to enable the IHE product vendors to test their products through the web anytime/anywhere. Basically, the vendors will connect to the portal and create/join virtual connectathon rooms, where they can test a whole scenario. The key point in the portal is the connectathon rooms. The connectathon rooms are like internet conference rooms where participants can talk to each other. In this platform, data visualization and representation for configuring healthcare information systems are critically important to helping nodes to maximize their availability in the healthcare networks and reduce the technical complications.

When we consider global electronic business in healthcare domain, ebXML[4] Framework is one of the promising technologies that can be used by compa-

nies, organizations, non-profit organizations, governments, or even individuals for healthcare applications. ebXML concentrates on collaborative business processes, which are business processes between parties.

The purpose of this thesis is to design and implement the IHE Configuration Management Tool(IHE-CMT) based on OASIS ebXML ebBP, CPP and CPA specifications. The objective of this research is to automate the creation and exchange of configuration information between IHE Actors for their business service interfaces i.e. software systems which are connecting the internal business to outer world. The algorithms and design decisions that are used in the implementation of the tools are provided through the text.

CHAPTER 2

Enabling Technologies

In this chapter the technologies that enables this work are described. First, Section 2.1 introduces the XML. Then, ebXML Framework is described in Section 2.2. Finally, Integrating the Healthcare Enterprise Framework is described in Section 2.3.

2.1 XML (Extensible Markup Language)

Extensible Markup Language (XML) is a simple, very flexible text format derived from SGML(ISO 8879)[5]. Originally designed to meet the challenges of large-scale electronic publishing, XML is also playing an increasingly important role in the exchange of a wide variety of data on the Web and elsewhere[6].

XML is a markup language for documents which contains structured information [7]. Content together with indications about the meaning of the content forms the structured information in a document. A markup language is a mechanism to identify structures in a document. The XML specification defines a standard way to add markup to documents. The basic syntax for one element in XML is presented in Figure 2.1.

XML provides a metadata-type framework. The tag names and attribute names used in an XML document defines the metadata. Unlike HTML there is

```
<name attribute="value">content</name>
```

Figure 2.1: Basic XML Syntax

no limit in using the tag names and attribute names but all XML documents must be well-formed. A well-formed XML document satisfies the conditions to be parsed correctly. For example each start tag should match an end tag of the same tag name. These tags represent elements of the documents and attributes are defined in start tags of elements.

2.2 ebXML (Electronic Business Extensible Markup Language)

2.2.1 ebXML Overview

ebXML is an international initiative established by UN/CEFACT[8] and OASIS[9]. "The United Nations Centre for Trade Facilitation and Electronic Business (UN/CEFACT) and the Organization for the Advancement of Structured Information Standards (OASIS) have joined forces to initiate a worldwide project to standardize XML business specifications. UN/CEFACT and OASIS have established the Electronic Business XML Working Group to develop a technical framework that will enable XML to be utilized in a consistent manner for the exchange of all electronic business data. Industry groups currently working on XML specifications have been invited to participate in the 18-month project." [10]

EDI(Electronic Data Interchange) has been used by the larger organizations while defining and implementing their systems. EDI has defined a common data-interchange format among these organizations. It has also defined the Business Processes in which these common data-interchange formats are used. Due to the high network infrastructure setup and running costs, and cost of system integration, EDI has proved to be very expensive solution. Considering the existing EDI networks, organizations among which EDI is used have tried to

enforce proprietary integration approaches. As a consequence, several ad-hoc EDI electronic business and collaboration solutions have appeared. In order to conduct electronic business over internet, following items were needed to be defined:

- Common Business Transactions e.g. Sending a Purchase Order
- Common Data-Interchange Formats i.e. Messages in the context of the above Transactions
- Mechanism for listing one organization's capabilities and the business transactions that this organization can perform in a common Repository accessible to all other organizations.
- Mechanism to allow organizations to discover companies and lookup their profile.
- Mechanism that allows two organizations to negotiate on the business terms before they commence transactions
- Common transport mechanism for exchanging messages between organizations
- Security and reliability framework

ebXML vision consists of these items. The ebXML initiative leverages from the success of EDI in large businesses, and intends reaching small and medium enterprises[11]. In other words, the vision of ebXML is to create a single set of internationally agreed upon technical specification that consists of common XML semantics and related document structures to facilitate global trade. It should be noted that ebXML is not about creating standard schemas or DTDs for common business documents such as purchase orders or invoices, but instead is about creating an infrastructure.

The ebXML specifications support the exchange of business messages required to conduct electronic trading relationships between business partners.

The ebXML capabilities provided by different specifications are logically separated. However, they can be used in a harmony. These key technology components of ebXML framework are:

- Communicating data in common terms using a defined methodology (Core Components)
- Defining business processes and assembling business transactions (ebXML Business Process Specification Schema, [ebBP][12])
- Providing secure and reliable transport (ebXML Messaging Service [ebMS][13])
- Registering and making available key eBusiness artifacts and services (ebXML Registry Services [ebRS][14] and Registry Information Model [ebRIM][15])
- Providing a technical configuration contract between business partners (Collaboration Protocol Profile and Agreements [CPP/CPA][16])

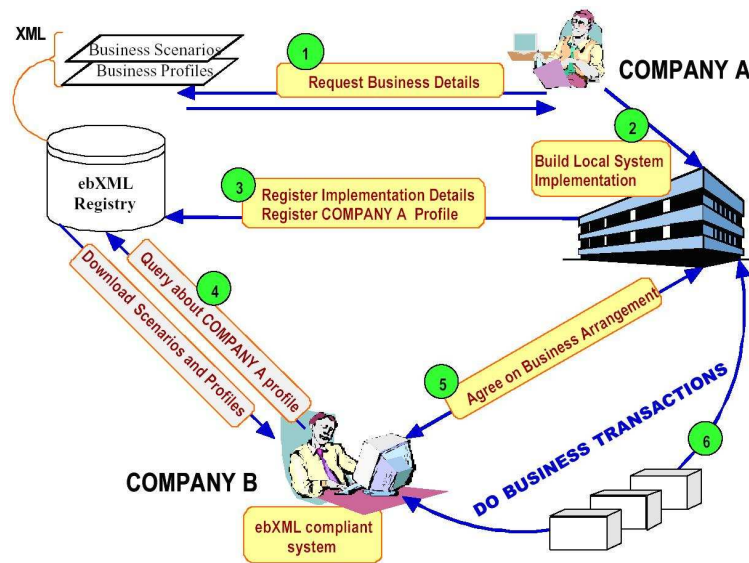


Figure 2.2: ebXML Technical Architecture

ebXML builds on the lessons learned from EDI, particularly the need to identify trading partners and messages and account for all message traffic. ebXML

also identifies common data objects, called core components, that allow companies to interchange standard EDI data with XML vocabularies compliant with the ebXML specifications. XML enables more open, more flexible transactions and innovative "eMarketplace" business models than EDI. However, EDI implementations encode substantial experience in Business Processes, and companies with large investments in EDI integration will not abandon them without good reason. The ebXML specifications provide a framework in which EDI's substantial investments in Business Processes can be preserved in an architecture that exploits XML's technical capabilities. It is a further objective of ebXML to facilitate migration of both traditional EDI-based applications and other legacy applications to ebXML platforms.

2.2.2 ebXML Functional Components

The ebXML architecture provides the following functional components as shown in Figure 2.3:

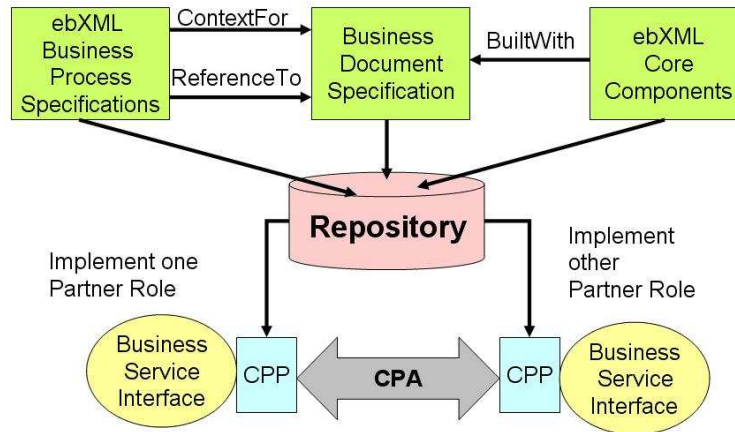


Figure 2.3: ebXML Functional Components

- *Registry/Repository*: A registry is a mechanism where business documents and relevant metadata can be registered such that a pointer to their location and their metadata can be retrieved as a result of a query. A

registry can be established by an industry group or standards organization. A repository is a location (or a set of distributed locations) where a document pointed at by the registry resides and can be retrieved by conventional means (e.g., http or ftp).

- *Trading Partner Information*: The Collaboration Protocol Profile (CPP) provides both DTD and XML Schema definitions of an XML document that specifies the details of how an organization is able to conduct business electronically. It specifies such items as how to locate contact and other information about the organization, the types of network and file transport protocols it uses, network addresses, security implementations, and how it does business (a reference to a Business Process Specification). The Collaboration Protocol Agreement (CPA) specifies the details of how two organizations have agreed to conduct business electronically. It is formed by combining the CPPs of the two organizations.
- *Business Process Specification Schema (BPSS - ebBP)*: The Specification Schema provides the definition of an XML document (in the form of an XML DTD) that describes how an organization conducts its business. While the CPA/CPP deals with the technical aspects of how to conduct business electronically, the Specification Schema deals with the actual business process.
- *Messaging Service*: ebXML messaging service provides a standard way to exchange messages between organizations reliably and securely. It does not dictate any particular file transport mechanism, such as SMTP, HTTP, or FTP.
- *Core Components*: ebXML provides a core component architecture where a core component is a general building block that basically can be used to form business documents.

2.2.3 ebXML Business Process Specification Schema - ebBP

The ebXML Business Process Specification Schema (BPSS or ebBP) technical specification defines a standard language by which business systems may be configured to support execution of Business Collaborations consisting of Business Transactions [12]. It is based upon prior UN/CEFACT work, specifically the metamodel behind the UN/CEFACT Modeling Methodology (UMM) defined in the "UN/CEFACT Modeling Methodology - Meta Model - Revision 10.

The specification schema supports the specification of business transactions and the choreography of business transactions into business collaborations. These patterns determine the actual exchange of business documents and business signals between the partners to achieve the required electronic commerce transaction. Business Collaboration consists of a set of specific roles collaborating through a set of choreographed Business Transactions. Each Business Transaction is conducted between two parties playing complementary abstract roles namely, the Requesting Role and the Responding Role.

Choreography is an ordering of Business Activities within a Business Collaboration. The purpose of a Choreography is to specify which Business Transaction Activity and/or Collaboration Activity should (are expected to) happen.

A Business Transaction is atomic; it cannot be decomposed into lower level message exchanges that could be reused independently unlike a Business Collaboration. Furthermore, one or more Business Signals may additionally be exchanged as part of a Business Transaction to ensure state alignment of the involved parties. There are a number of States that facilitate the choreographing of Business Activities. These include a Start state and a Completion state (which comes in a Success and Failure flavor) as well as a series of gateways: a Fork gateway, a Join gateway and a Decision gateway. In ebBP, the Business Transactions are defined as an abstract super class with eight concrete business patterns as follows:

- *Commercial Transaction (or Business Transaction)*: Typically this pattern defines a formal obligation between parties. The semantics defined by

commercial transaction is as follows:

- A response is required.
- Either a request receipt acknowledgment or exception is required.
- Either response receipt acknowledgment or exception is required.
- *Notification*:Used for business notifications such as a Notification of Failure. It represents a formal exchange between parties.
- *Information Distribution*:Represents an informal information exchange between parties.
- *Query/Response*:Used by a requester for an information query of which the responding party already has.
- *Request/Confirm*:Used where an initiating party requests confirmation about their status with respect to previous obligations or a responder's business rules.
- *Request/Response*:Used when an initiating party requests information that a responding party already has and when the request for business information requires a complex interdependent set of results.
- *Data Exchange*:Allows a partner, industry or community to define a specific Business Transaction pattern that is not in the concrete set. The semantics used for data exchange are partner-specific.
- *Legacy Business Transaction*:Retained in v2.0 and v2.0.1 technical specifications for conversion purposes only to enable the user community to migrate to the concrete patterns. This pattern is not recommended for use for the concrete Business Transaction patterns.

An ebBP definition references, but does not define, a set of logical Business Documents. It is important to note that the ebBP technical specification focuses on the logical Business Document not a wire format and hence has nothing to

do with the ebXML Messaging Service (ebMS) message envelope (SOAP with Attachments) which is wire format.

2.2.4 ebXML Collaboration Protocol Profile and Agreement - ebCPPA

The objective of Collaboration-Protocol Profile (CPP) and Agreement (CPA) Specification [16] is to ensure interoperability between two Parties even though they may have heterogeneous application software and run-time support.

Message-exchange capabilities of a Party as a Business Partner in a Business transaction are described by CPP. The CPP is the formal description file that lists what an organization can do in terms of ebXML operations. Formal means it is machine processable. A CPP contains:

- the organization's name and contact information
- the transport and security protocols it recognizes
- the messaging protocols it recognizes
- the business processes it recognizes
- all kind of technical information such as URLs, timeouts, certificates

The message exchange agreement between two parties is described by CPA. A CPA describes all the valid visible, and hence enforceable, interactions between the parties and the ways these interactions carried out. The information in the CPA is used to configure the parties' systems to enable exchange of messages for the selected business collaboration, which may be defined in ebBP.

The CPA is the technical agreement between the two companies. This idea of having a CPA as configuration file is very useful considering that a company might have 100 or more different CPAs. To complete the ebXML infrastructure a company can use an ebXML Business Service Interface (BSI). The BSI will use the corresponding collaborative business process referenced in the CPA[17].

2.3 IHE - (Integrating the Healthcare Enterprise)

2.3.1 IHE Overview

Started by HIMSS[18] and RSNA[19], IHE is a spontaneous initiative, organized to improve the integration of systems. It aims at providing a process for a coordinated adoption of standards: clinicians and IT staff define needs; vendors develop solutions (a technical Framework). In 2004, 50 vendors were involved in the USA, 34 in Asia, and 58 in Europe. Professional societies (ECR, BIR, DRG, SIRM, HIMSS/RSNA, etc.) supervise documentation, testing, demonstration, and promotion. Partnerships also exist currently with the American College of Cardiology (ACC), American College of Clinical Engineering (ACCE), HL7, and DICOM. Several individual members take part as well.

The European chapter of IHE is also supported by several users' organisations, especially scientific societies (the European Society for Cardiology, SFR, also GMSIH, etc.).

IHE is an independent private initiative that results from a partnership without formal legal status between these vendors and professional societies. They collectively manage its budget. Participants from the software industry voluntarily participate, for a fee, to the testing and demonstration process, with a return on their investment in the form of a reduced installation efforts and a commercial advantage. Users' organizations also contribute at their own expense. This initiative aims at speeding up the rate and quality of integration in healthcare environments, fostering communication among vendors, proving that integration is attainable based on standards, and improving the efficiency and effectiveness of clinical practice.

The needs for the IHE initiative comes from the statement that standards are necessary but not sufficient for seamless implementations: they are not 'plug and play' as each interface requires site specific analysis and configuration and eventually they may be costly to implement and to maintain. IHE delivers integration profiles built on existing standards. IHE makes it clear that it is not a

standards development organization. It uses existing standards (so far DICOM, HL7, Internet, OASIS, etc.) to address specific clinical needs. Its activity is to be regarded as complementary to SDOs. It has a formal relationship with HL7, DICOM, and ASTM.

IHE is not simply a demonstration project, for IHE demonstrations represent only one means to the end of adoption of integration profiles and standards. These demonstrations are backed up by documentation, tools, testing, and publication of information.

The IHE initiative is both an intra-enterprise and cross-enterprise, bottom-up approach supporting a multi-year, standards based, vendor neutral project that creates a framework to seamlessly convey vital information from application to application, system to system, and setting to setting. The foreseen benefits claimed by the IHE initiative for its participants do not differ from those of standards in general, but the emphasis is put on the practical limitations in the implementation of standards.

2.3.2 IHE Integration Profiles

An IHE Integration Profile organizes a set of coordinated, standards-based transactions between a subset of the functional components of health organizations in order to address a specific clinical or infrastructure need. IHE develops such solutions for IT systems integration in a stepwise and pragmatic manner, focusing on the most common integration challenges. It has developed close to 40 Integration Profiles focused on Radiology, Laboratory, IT Infrastructure (MPI, Security, etc.) and Cardiology and Medication. It is now considering Nuclear Medicine and the exchange of clinical documents across the borders of an enterprise (eHealth).

IHE profiles are devised in an intensive process based on a stepwise approach, according to annual cycles:

- the development of profiles is done at the global level, by an open group of volunteer users and vendors;

- the deployment is organised by (world) regions, and by countries, based on national 'chapters';
- Connect-a-thons are organised at the 'regional' level (a number of national centres co-operate with IHE).

IHE Integration Profiles provide a common language for purchasers and vendors to discuss integration needs of healthcare enterprises and the integration capabilities of products. The goal for most healthcare organizations is to implement practical capabilities such as distributed access to diagnostic images or smooth departmental workflow. Integration Profiles allow communication about those high-level capabilities while referencing the underlying technical precision necessary to make them work. They give purchasers a tool that reduces the difficulty, cost and anxiety associated with implementing integrated systems.[20]

CHAPTER 3

IHE Configuration Management Tool - IHE-CMT

The thesis research resulted in the design and development of the IHE Configuration Management Tool. In this chapter, details of the IHE Configuration Management Tool architecture are presented.

The focus of the tool presented here is on building a framework that makes it possible to automate the creation and the configuration of electronic relationship among IHE actors within a connectathon using ebXML components. In order to achieve this goal, IHE business processes containing IHE transactions are described through ebBP and the actors through CPPs (Collaboration Protocol Profiles) [16]. The electronic relationship is then established through CPAs which represent the agreement among the partners exchanging information.

3.1 Introduction

When the communication among IHE Actors in a healthcare business process is considered, a particular IHE Actor is in need of the configuration of its electronic relationship with others. Each IHE Actor needs to discover the other IHE Actors, their supported IHE Transactions, their roles in the Transactions, and the configuration details about how the other Actors send and receive messages.

Considering the current connectathon setups, for instance, the IHE Actors obtain network configuration parameters from an online database quite some time before the connectathon to configure their network parameters. This information is exchanged between the IHE system administrators and vendors. The information available is restricted to a small set of technical parameters. The compatibility checks between actors performing in a particular IHE transaction is done manually.

In order to take advantage of comprehensive definition capabilities provided by ebXML Collaboration Protocol Profile and Agreement Specification, the CPA is used to carry configuration information between two collaborating parties using their detailed CPP descriptions. The output of IHE Configuration Management Tool provides all the configuration information needed by the IHE Profiles and helps this information to be discovered and used at run time in real life cases without human intervention.

3.2 Design of the System

This section presents the architectural decisions and important concepts that affected the implementation of the IHE Configuration Management Tool.

Cross-Enterprise Document Sharing(XDS) is one of the IHE integration profiles and it is used to as the main input for the definition of the ebBP representation of IHE profiles and algorithms of CPP and CPA formation.

3.2.1 Machine Processable Representation of IHE Technical Framework

IHE defines a technical framework for the implementation of specific clinical goals. IHE Profiles define IHE Actors and IHE Transactions and organizes them into IHE Profiles specific to the healthcare domain. IHE profiles further constrain configuration choices where necessary in standards such as HL7, ASTM, DICOM to ensure that they can be used in their respective domains in an integrated manner between different actors.

The IHE IT Infrastructure Technical Framework identifies a subset of the functional components of the healthcare enterprise, called IHE actors, and specifies their interaction in terms of a set of coordinated, standards based transactions. The IHE actors and transactions are abstractions of the real world healthcare information systems.

Throughout this thesis research, ebXML Business Process Specification Schema (ebBP) is used to represent the interactions among functional components of the healthcare information system. The ebXML BP Editor[21] is used to create the necessary ebBP definitions. Appendix C contains a sample ebBP definition created by ebBP Editor.

The XDS facilitates the registration, distribution and access across health enterprises of patient electronic health records. Figure 3.1 depicts the actors and transactions defined in IHE XDS profile.

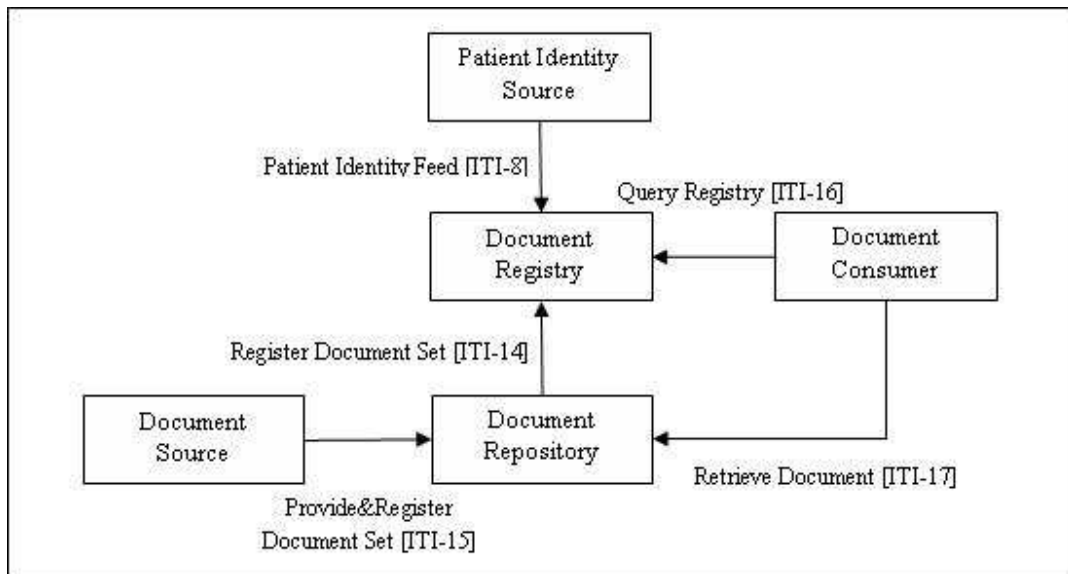


Figure 3.1: Cross-Enterprise Document Sharing Diagram

ebBP specification defines a standard language which represents execution of business collaborations consisting of business collaborations. Basically, ebBP specifies the business transactions and choreography of these business transactions into business collaborations. Each integration profile in IHE is a represen-

tation of a real world scenario performed by a set of actors interacting through transactions. Using this similarity, the mapping of IHE profiles on the ebBP technical specification is achieved. The correspondence between basic IHE and ebBP concepts is given as:

- IHE actors correspond to ebBP Roles,
- IHE transactions correspond to ebBP Business Collaborations,
- IHE Profiles correspond to ebBP Business Processes, and
- IHE messages and the documents used in a Business Transactions correspond to ebBP Business Documents.

ebBP definitions of IHE does not bring any change to existing IHE Profiles and its existing implementations. As ebBP Processes are not executable, but they are machine processable, one can use the information content by executing a software. ebBP definitions of IHE profiles helps this thesis research by documenting the already existing information in IHE profiles in a machine processable way to help with configuration issues which are tackled by IHE Configuration Management Tool.

3.2.2 Collaboration Protocol Profile Formation

This section provides the details of forming a CPP using the information available in the ebBP definition of IHE integration profiles and user input in a semi-automatic manner. Instead of taking all required data for the CPP fields, ebBP elements are extracted and the used CPP formation process to aid populating the CPP xml element values.

For an IHE Actor, a CPP definition contains the capabilities of that actor to engage in electronic relationship with other actors. The formation process contains several steps in which the ebBP definition is referred to extract the necessary data values.

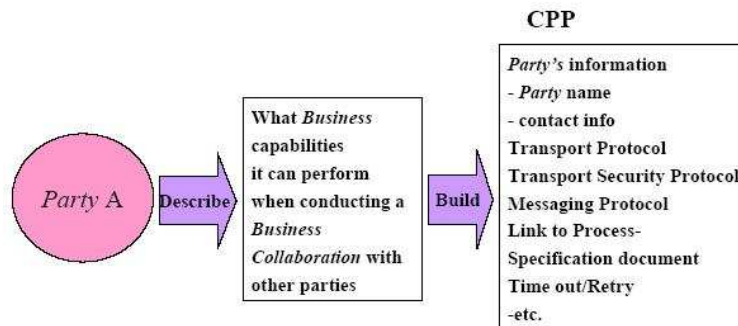


Figure 3.2: Overview of Collaboration Protocol Profiles

3.2.2.1 Determining the role of the actor

The ebBP definition contains a set of roles collaborating through a set of choreographed transactions. An IHE actor participates in the business collaborations representing health care system interactions through these roles as business partner. At the beginning of CPP formation process, the actor definition reference in the ebBP definition of the IHE profile should be resolved.

```

<BusinessCollaboration name="Collaboration of
ATNA-ITI-19-XDS-ITI-15-ATNA-ITI-20"
nameID="ATNA-ITI-19-XDS-ITI-15-ATNA-ITI-20">
  <Role name="XSDDocumentRegistry XSDDocumentRepository ATNASecureNode"
nameID="ATNA-ITI-19-XDS-ITI-15-ATNA-ITI-20XSDDocumentRegistry-XSDDocumentRepository-ATNASecureNode" />
  <Role name="XSDDocumentSource" nameID="ATNA-ITI-19-XDS-ITI-15-ATNA-ITI-20XSDDocumentSource" />
  <Role name="ATNAAuditRepository" nameID="ATNA-ITI-19-XDS-ITI-15-ATNA-ITI-20ATNAAuditRepository" />
  <TimeToPerform /><Start>
  <ToLink toBusinessStateRef="CA1-ATNA-ITI-19" />
  </Start>
  <CollaborationActivity collaborationRef="ATNA-IHE-ITI-19"
name="Node Authentication" nameID="CA1-ATNA-ITI-19">
  ...

```

Figure 3.3: ebBP BusinessCollaboration Element

The association of the IHE Actor role in the ebBP Business Collaboration is done with CollaborationRole element of CPP. The BusinessCollaboration given in Figure 6 contains three role definitions for IHE Actors. These are "XSDDocumentSource", "ATNAAuditRepository" and "XSDDocumentRegistry XSDDocumentRepository ATNASecureNode". "XSDDocumentRegistry XSDDocumentRepository ATNASecureNode" contains three individual IHE Actor roles which

are grouped together to represent that this actor takes the responsibility of all XSDDocumentRegistry, XSDDocumentRepository and ATNATSecureNode actors.

```

<ns1:CollaborationRole> <ns1:ProcessSpecification
  ns4:href="http://localhost:8080/vcp/ebbp/
  XSDDocumentRegistry-XSDDocumentRepository-ATNATSecureNode.xml"
  ns4:type="simple" ns1:name="IHE IHE-BusinessCollaborations Profile"
  ns1:uuid="urn:metu-srdc:names:specification:iheIHE-BusinessCollaborationsprofile:schema"
  ns1:version="Unknown" xmlns:ns4="http://www.w3.org/1999/xlink" />

  <ns1:Role
    ns5:href="http://localhost:8080/vcp/ebbp/
    XSDDocumentRegistry-XSDDocumentRepository-ATNATSecureNode.xml#XSDDocumentRegistry
    XSDDocumentRepository ATNATSecureNode" ns5:type="simple"
    ns1:name="XSDDocumentRegistry XSDDocumentRepository ATNATSecureNode"
    xmlns:ns5="http://www.w3.org/1999/xlink" />
  ...

```

Figure 3.4: CPP CollaborationRole Element

”XSDDocumentRegistry XSDDocumentRepository ATNATSecureNode” role defined in ebBP is assigned to the Role definition under the CollaborationRole element of CPP. User interaction is needed here to determine which role defined in the IHE profile the party is capable of supporting. Roles defined in an ebBP which can also be used in the CPP definition for an IHE Actor are extracted with the help of domain configuration information available in IHE.

```

for each <Role> element in IHE Profile ebBP definition
  for each <Actor> element in IHE Domain Configuration
    if (role defined in ebBP equals actor name)
      then Add the role definition to the list

```

Figure 3.5: Algorithm for populating the IHE Actor Roles from ebBP

3.2.2.2 Identification of the IHE Actor

The CPP PartyInfo element is used to identify the healthcare organization representing the IHE actor. User input is required for human readable name of the organization and a link in the form of URI to additional information about the organization.

```

<ns1:PartyInfo ns1:defaultMshChannelId="SyncChannel1"
  ns1:defaultMshPackageId="MshSignalPackage" ns1:partyName="Sample
  Organization 1"> <ns1:PartyId
  ns1:type="urn:oasis:names:tc:ebxml-cppa:partyid-type:duns">
  10d37b24-8f8c-11db-bf80-f1554e116909</ns1:PartyId>
  <ns1:PartyRef ns3:href="http://www.sampleorganization.com"
  ns3:type="simple" xmlns:ns3="http://www.w3.org/1999/xlink" />
  ...

```

Figure 3.6: CPP PartyInfo Element

The most important issue in identifying an IHE Actor is determining the party id of the organization. The PartyId element of CPP should provide an identifier that is used to logically identify the party. The PartyId should provide a unique identifier. The party identifier is typically anyURI type defined by XML Schema. The PartyId element value is assigned to a universally unique id generated during the CPP formation process.

3.2.2.3 Process Specification Check and Collaboration Setup

In order to reflect the valid interactions between IHE actors defined in ebBP, CPP should contain a link to the process specification document. The ebBP representation of IHE profile contains the business process specification which is performed. The name of process specification defined in ebBP should be referred in CPP definition of the IHE Actors.

```

<ProcessSpecification name="IHE IHE-BusinessCollaborations
  Profile" nameID="IHE-IHE- BusinessCollaborations-Profile"
  uuid="urn:metu-srdc:names:specification:iheIHE-
  BusinessCollaborationsprofile:schema" xmlns:xi="http://www.w3.org/2001/XInclude"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
  ...

```

Figure 3.7: ebBP ProcessSpecification Element

The name attribute of ProcessSpecification element given in Figure 10 is assigned to the name attribute of CPP ProcessSpecification element as shown in Figure 3.3. Like the name, version information of the process specification is carried to the CPP in similar way. Role name available in the CPP Pro-

processSpecification should refer to a valid, available role definition in the ebBP representation of IHE profiles. The role href link should point to a valid XML node representing an IHE actor in the context of ebBP process specification definition.

In order to identify the process specification, uuid attribute of CPP ProcessSpecification element should be set to the uuid of the ProcessSpecification defined in ebBP.

```
<ns1:ServiceBinding>
  <ns1:Service>urn:metu-srdc:names:specification:iheIHE-BusinessCollaborationsprofile:schema
</ns1:Service>
  ...

```

Figure 3.8: CPP Service Element

If the ebXML Messaging is to be used during the runtime execution of the defined process specification, the value of Service element should also be set to the uuid of the process specification. The value of the Service element is used in the ebMS Message Header to inform the counter party about the current process specification used.

3.2.2.4 Service and Action Binding Setup

Service and its message traffic for the IHE actors in the context of the identified IHE profiles process specification should be defined within the CPP. For IHE actor or IHE actor group identified in the CPP performs transaction(s) in some IHE profiles given in the ebBP definitions. Each of these profiles contains transactions and each transaction represents a binary collaboration performed between an initiating and responding IHE actors. These transactions should be determined and classified into two sets: transactions in which IHE actor as initiating party and IHE actor as responding party.

- Patient Identity Feed,
- Register Document Set,

- Query Registry,
- Provide and Register Document Set,
- Retrieve Document,
- Node Authentication,
- Record Audit Event

XDSDocumentRegistry XDSDocumentRepository ATNATransaction actor plays a role in more than one profile, which also means more than one transaction. The list above presents these transactions. Identification of these transactions populates a list of IHE transactions to be firstly checked and then used to derive service specific information to put into the CPP.

IHE technical framework provides general description about the message payload constituents exchanged in business document flows between requesting and responding parties performing roles. The ServiceBinding element pointing to a specific IHE profiles process specification should be populated with the CanSend elements identifying the action messages that an actor is capable of sending or with the CanReceive element identifying the action invocation messages that an actor is capable of receiving. For each of the transaction that includes different constructs within business messages defined in IHE technical framework, a CanSend or CanReceive element should be added. "XDSDocumentRegistry XDSDocumentRepository ATNATransaction" can play in ITI-16 Query Registry transaction as the receiver of messages. This is reflected to the CPP by adding the CanReceive element containing information about the Query Registry business transaction activity.

The important step in the service binding setup is configuring the action bindings for each CanSend and CanReceive element. ThisPartyActionBinding element specifies the delivery channels and for the messages for the selected action and it also presents the packaging for those messages that are to be sent or received by the IHE actors. ThisPartyActionBinding action attribute

```

<ns1:CanReceive> <ns1:ThisPartyActionBinding ns1:action="IHE XDS
Query Registry BTA Action"
ns1:id="27193bb1-8f8c-11db-bf80-f1554e116909"
ns1:packageId="ReceiptAckPackage" ns82:type="simple"
xmlns:ns82="http://www.w3.org/1999/xlink">
  <ns1:BusinessTransactionCharacteristics ns1:isAuthenticated="persistent"
ns1:isAuthorizationRequired="true" ns1:isConfidential="persistent"
ns1:isIntelligibleCheckRequired="false" ns1:isNonRepudiationReceiptRequired="true"
ns1:isNonRepudiationRequired="true" ns1:isTamperProof="none" />
  <ns1:ActionContext ns1:binaryCollaboration="IHE XDS Query Registry"
ns1:businessTransactionActivity="IHE XDS Query Registry BTA"
ns1:requestOrResponseAction="Query Registry Responding Business Activity" />

  <ns1:ChannelId>SyncChannel1</ns1:ChannelId>
</ns1:ThisPartyActionBinding> <ns1:CanSend>
  <ns1:ThisPartyActionBinding ns1:action="IHE XDS Query Registry BTA Action" n
ns1:id="272570b2-8f8c-11db-bf80-f1554e116909" ns1:packageId="RequestPackage"
ns83:type="simple" xmlns:ns83="http://www.w3.org/1999/xlink">
  <ns1:BusinessTransactionCharacteristics ns1:isAuthenticated="persistent"
ns1:isAuthorizationRequired="true" ns1:isConfidential="persistent"
ns1:isIntelligibleCheckRequired="false" ns1:isNonRepudiationReceiptRequired="true"
ns1:isNonRepudiationRequired="true" ns1:isTamperProof="none" />
  <ns1:ActionContext ns1:binaryCollaboration="IHE XDS Query Registry"
ns1:businessTransactionActivity="IHE XDS Query Registry BTA"
ns1:requestOrResponseAction="Query Registry Requesting Business Activity" />
  <ns1:ChannelId>SyncChannel1</ns1:ChannelId>
</ns1:ThisPartyActionBinding>
</ns1:CanSend>
...

```

Figure 3.9: CPP CanReceive Element

is set to a string which identifies the business document exchange within a specific IHE transaction. Figure 3.9 shows an example `ThisPartyActionBinding` element in a `CanReceive` element. `ThisPartyActionBinding` element contains crucial information for document flow. `BusinessCharacteristics` element within `ThisPartyActionBinding` describes the security characteristics and attributes of delivery channel. Some place holder or default values can be assigned for these elements as IHE technical framework defines technical details for the system implementers. This is depicted in Figure 3.10.

```

<ns1:BusinessTransactionCharacteristics
ns1:isAuthenticated="persistent"
ns1:isAuthorizationRequired="true" ns1:isConfidential="persistent"
ns1:isIntelligibleCheckRequired="false"
ns1:isNonRepudiationReceiptRequired="true"
ns1:isNonRepudiationRequired="true" ns1:isTamperProof="none" />
...

```

Figure 3.10: CPP BusinessTransactionCharacteristics Element

ActionContext element provides a mapping from the action attribute in the ThisPartyActionBinding element to the corresponding ebBP definition. The binaryCollaboration, businessTransactionActivity, requestOrResponseAction attributes are assigned values taken from the IHE profiles process specification. This should be done automatically for each identified transaction of the IHE actor that will be put into the CPP definition. The action name actually represent a particular business activity in the context of the binary collaboration. ActionContext element presents very important data when composing two CPPs and forming a CPA. Information associated to the ActionContext element determines whether different action names from CPPs actually represent the same context.

3.2.2.5 Communication Parameters

Communication parameters include network communication capabilities given in the CPP for an IHE actor. In CPP of an IHE actor, Transport element is used to describe the mechanisms actor uses to send messages or receive messages. In order to configure transport related parameters, input from user has to be taken.

```
<ns1:Transport ns1:transportId="Transport1">
  <ns1:TransportSender>
    <ns1:TransportProtocol ns1:version="1.1">HTTP</ns1:TransportProtocol>
  </ns1:TransportSender>
  <ns1:TransportReceiver>
    <ns1:TransportProtocol ns1:version="1.1">HTTP</ns1:TransportProtocol>
    <ns1:Endpoint ns1:uri="http://144.122.230.177/sampleorg/iheservice" />
  </ns1:TransportReceiver>
</ns1:Transport>
...
```

Figure 3.11: CPP Transport Element

Firstly, the protocol and version information should be defined. The next point is the definition of an endpoint which specifies a logical address for the IHE actor's business service interface.

3.2.3 Collaboration Protocol Agreement Formation

This section provides the details of forming a CPA from two CPPs automatically. Instead of taking two CPPs and creating the CPA manually, there is a need to have an algorithm that handles the time consuming and complex parts of CPA formation process.

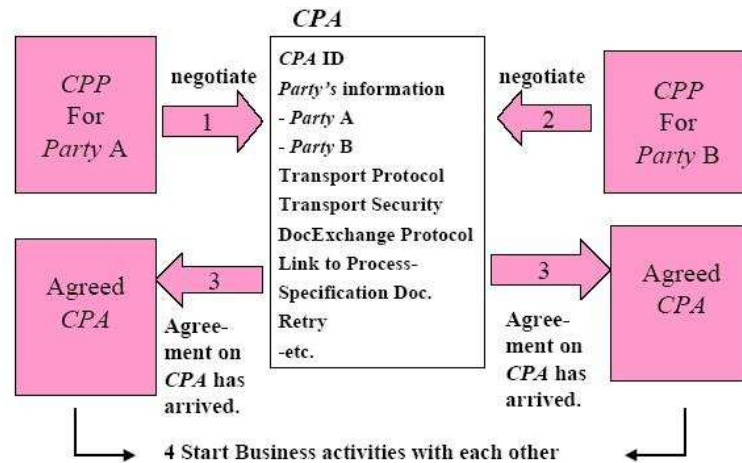


Figure 3.12: Overview of Collaboration Protocol Agreement

3.2.3.1 Determining the roles for CPA formation

The roles defined in IHE transactions define the logical complementary partner relationship. For the first step of the CPA formation process, user input is needed to specify the collaborating actors. The actors can be referred from the ebBP definition of the IHE profile i.e. the roles available in the IHE ebBP Process specification document can be extracted and presented to the user for the selection of appropriate roles.

3.2.3.2 Providing CPP for each of the roles

Engaging of IHE Actors as business partners in IHE transactions is the most important issue for the collaborative business. Each actors business and technical capabilities in message exchanges with other partners are defined in CPP. The

CPA formation process requires CPP documents providing information about the IHE actors to compute the intersection and further process to create the CPA document. The information available in both CPPs are used in CPA in two ways: directly copied to CPA without any change, or processed, updated and put into CPA.

```

<ns1:PartyInfo ns1:defaultMshChannelId="SyncChannel1"
ns1:defaultMshPackageId="MshSignalPackage"
ns1:partyName="591Demo">
  <ns1:PartyId ns1:type="urn:oasis:names:tc:ebxml-cppa:partyid-type:duns">
    97ed3b7e-7fb0-11db-8b79-d5ceb3dda5d3</ns1:PartyId>
  <ns1:PartyRef ns2:href="http://www.srdc.metu.edu.tr" ns2:type="simple"
  xmlns:ns2="http://www.w3.org/1999/xlink" />
  <ns1:CollaborationRole>
  <ns1:ProcessSpecification ns4:href="http://localhost:8080/vcp/ebbp/
  XDSDocumentRegistry-XDSDocumentRepository-ATNASecureNode.xml"
  ns4:type="simple" ns1:name="IHE IHE-BusinessCollaborations Profile"
  ns1:uuid="urn:metu-srdc:names:specification:iheIHE-BusinessCollaborationsprofile:schema"
  ns1:version="Unknown" xmlns:ns4="http://www.w3.org/1999/xlink" />
  <ns1:Role ns5:href="http://localhost:8080/vcp/ebbp/XDSDocumentRegistry-
  XDSDocumentRepository-ATNASecureNode.xml#XDSDocumentSource" ns5:type="simple"
  ns1:name="XDSDocumentSource" xmlns:ns5="http://www.w3.org/1999/xlink" />
  <ns1:ServiceBinding>
  ...
<ns1:PartyInfo ns1:defaultMshChannelId="SyncChannel13"
ns1:defaultMshPackageId="MshSignalPackage11"
ns1:partyName="demo2">
  <ns1:PartyId ns1:type="urn:oasis:names:tc:ebxml-cppa:partyid-type:duns">
    1e4d41d4-7fb1-11db-8b79-d5ceb3dda5d3</ns1:PartyId>
  ...

```

Figure 3.13: CPA CollaborationRole Elements for each of the IHE Actors

The CPA formation process takes these two CPP documents corresponding to complementary roles of IHE Actors and starts to analyze both CPPs for compatibility. Role definitions given in ebBP BusinessCollaboration element are associated to the CollaborationRole elements defined for each of two IHE Actors in the CPA. The CollaborationRole elements are directly copied to the CPA from the CPPs. The roles should be checked whether they are complementary according to the referred ebBP business collaboration definition.

3.2.3.3 Identifier Reference Check

CPA composed from two CPPs of IHE actors needs to guarantee that ID values in one CPP are distinct from the ID values in the other CPP so that no ID

references collide when CPPs are merged. In order to avoid such a problem each id reference within the first CPP document should be checked by the id references existing in the second CPP.

```

...
<ns1:CompositeList> - <ns1:Composite ns1:id="RequestMsg"
ns1:mimeparameters="type=text/xml"
ns1:mimetype="multipart/related">
  <ns1:Constituent ns1:idref="MsgHdr" />
  <ns1:Constituent ns1:idref="Request" />
</ns1:Composite>
</ns1:CompositeList>
...

```

Figure 3.14: Sample IDREF references in CPP

Checking the ID fields in two CPPs and updating the colliding ID fields to prevent conflicts should be done before continuing the CPA formation process. The algorithm depicted in Figure 3.15 shows how the id conflicts are resolved within a CPA during processing of the CPP documents.

```

for each <PartyInfo> element in CPP of IHE Actor 1
  for each <PartyInfo> element in CPP of IHE Actor 2
    resolve certificate id conflicts(Certificate.CertId);
    resolve security id conflicts(SecurityDetails.SecurityId);
    resolve document exchange id
    conflicts(DocExchange.DocExchangeId);
    resolve transport id conflicts(Transport.TransportId);
    resolve delivery channel
    conflicts(DeliveryChannel.ChannelId);
    resolve simple part id conflicts;
    resolve packaging id conflicts;
for each <PartyInfo> element in CPP of IHE Actor 1
  for each <PartyInfo> element in CPP of IHE Actor 2
    check ThisPartyActionBinding element id;

```

Figure 3.15: Algorithm for id reference conflict resolution

3.2.3.4 Validation of Process Specification and roles

After determining the roles for the CPA formation, CPP documents corresponding to each of the roles should be checked for validity in terms process specification defined in ebBP. CPP should contain a link to the process specification document and this link is defined by the uuid attribute of the ProcessSpecifi-

```

<ns1:CollaborationRole>
  <ns1:ProcessSpecification
    ns4:href="http://localhost:8080/vcp/ebbp/XSDDocumentRegistry-
XSDDocumentRepository-ATNATSecureNode.xml"
    ns4:type="simple" ns1:name="IHE IHE-BusinessCollaborations Profile"
    ns1:uuid="urn:metu-srdc:names:specification:iheIHE-BusinessCollaborationsprofile:schema"
    ns1:version="Unknown" xmlns:ns4="http://www.w3.org/1999/xlink" />

```

Figure 3.16: ProcessSpecification uuid Attribute in CPP

cation element of the CPP depicted in Figure 3.16. It should match the uuid attribute of ProcessSpecification element in ebBP definition.

The CPPs may contain more than one complementary IHE actor pairs that can be put into CPA. User input should be used to select appropriate role pair. There are many possibilities of different ProcessSpecification pairs. The CPA formation process has to decide which possibilities are compatible and which ones are not compatible.

After deciding the compatible process specification for both of the IHE Actors, role matching is performed. The two Role elements name attributes cannot be the same. They must be complementary to define valid CPA. ebBP definition is referred to check whether the roles are complementary or not.

```

for each <PartyInfo> element p1 in CPP of IHE Actor 1
  for each <PartyInfo> element p2 in CPP of IHE Actor 2
    for each <CollaborationRole> element c1 in p1
      for each <CollaborationRole> element c2 in p2
        if(Process Specification in c1 equals
Process Specification in c2)
          if(Role in c1 not equal Role in c2)
            and
              (Role in c1 is valid in Process Specification in c1)
            and
              (Role in c2 is valid in Process Specification in c2)
          then Extract the roles as compatible candidates.

```

Figure 3.17: Algorithm for Role matching

Role matching algorithm is given in Figure 3.17.

3.2.3.5 Candidate Binding Matching

CPP documents for the IHE Actors contains several bindings for services and actions. The CPA formation process should support specific candidate binding matching. At the base, CPA formation process should define how to match business processes defined by ebBP and referred by CPP documents.

The candidates are searched for each transaction defined between the IHE actors, whose CPPs are processed to form the CPA. The IHE integration profiles define the details of interactions between IHE Actors. This information available before processing is used to facilitate the matching process. See Appendix A.

```
for each <PartyInfo> element p1 in CPP of IHE Actor 1
  for each <BusinessCollaboration> element bc in ebBP
    for each <BusinessTransactionActivity> element bta in bc
      for each <CanSend> element cs of IHE Actor 1
        for each <CanReceive> element cr of IHE Actor 2
          if(ActionContext in ThisPartyActionBinding in cs equals to
             bta name)
            and
              (ActionContext in ThisPartyActionBinding in cr equals to
               bta name)
            then
              Check delivery channels and Match transports;
              Match Packages;
```

Figure 3.18: Algorithm for binding matching

In the CPP of a IHE Actor, ServiceBinding element contains information about the implementation of the business process in terms of exchanged business messages. The sending and receiving parts of IHE profiles are represented by a CanSend or a CanReceive element, respectively. Candidate binding matching algorithm is given in Figure 3.18.

3.2.3.6 CPA Specific Configuration Parameters

CPA document contains some parameters related to the established agreement. The value of "Status of Configuration" parameter can be "Agreed", "Signed" or "Proposed". The lifetime of the configuration is provided by CPA "Start" and "End" elements. Invocation Limit and number of Concurrent Conversations should also be specified. The user input should be taken at this stage of the CPA

formation process. Figure 3.19 shows a sample values for CPA configuration parameters.

```
for each <PartyInfo> element p1 in CPP of IHE Actor 1
  <ns1:Status ns1:value="agreed" />
  <ns1:Start>2006-11-29T00:00:00+02:00</ns1:Start>
  <ns1:End>2011-11-29T00:00:00+02:00</ns1:End>
  <ns1:ConversationConstraints ns1:concurrentConversations="10" ns1:invocationLimit="10000" />
  ...
```

Figure 3.19: CPA Parameters

3.3 Implementation of the System

This section presents the implementation details of the IHE Configuration Management Tool.

Figure 3.20 depicts the tool’s startup window. A generic CPA Editor can also work for IHE however since IHE fixes many of the parameters, customizing CPP Editor and CPA Editors to IHE, facilitates and speeds up the usage of these editors in real life scenarios. The tool is enriched with the rules extracted from already known information for the IHE transactions. IHE-CMT consists of two complementary tools: IHE-CMT CPP Editor and IHE-CMT CPA Editor. Through the graphical user interfaces provided by IHE-CMT CPP Editor, each IHE Actor can define its CPP according to its configuration specification and according to the business specifications it is involved in. And through the IHE-CMT CPA Editor, a valid CPA specification can be formed by incorporating the CPPs of the involved Actors such that:

- The roles of the Actors referred in the corresponding CPPs must be complementary in the business processes referred. For example, in the CPP of the IHE "Document Repository" Actor, IHE XDS business process is referred. One of the complementary roles in IHE XDS business process for the "Document Repository" Actor is "Document Source" Actor and this information is already available from the Business Collaboration hence is automatically obtained and processed.

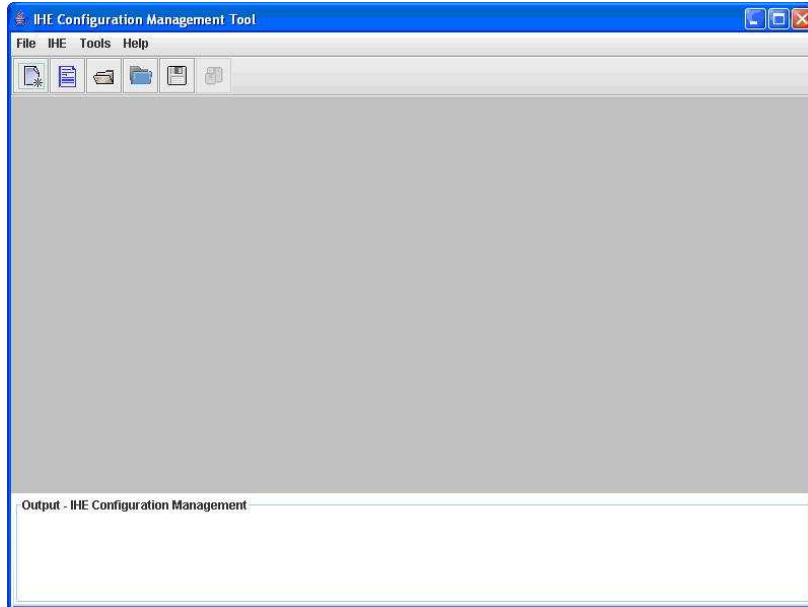


Figure 3.20: IHE-CMT Startup Window

- The communication means must be compatible.
- Information about the certificates that are available in CPP PartyInfo element are automatically incorporated into the CPA.
- The valid MIME Types are given in the respective CPPs of IHE actors and these MIME types for each Business Document are automatically checked and incorporated into the CPA.
- The identifier conflicts across the CPPs must be resolved before CPA formation process and these conflicts are automatically achieved.
- The starting and ending date of the CPA which define the validity time interval for the CPA are entered through Configuration Management Tool. Also, conversation constraints defining maximum number of conversations and maximum concurrent conversation limit are set through this tool.

Since IHE-CMT is IHE specific, one of the menu items directly lists all the IHE business process specifications. Note that an IHE process specification

can be IHE Profiles or a business process describing a set of combined IHE Profiles obtained through IHE Actor Grouping (output of IHE-AGT). IHE-CMT displays all the deployed IHE business process specifications as shown in Figure 3.21.

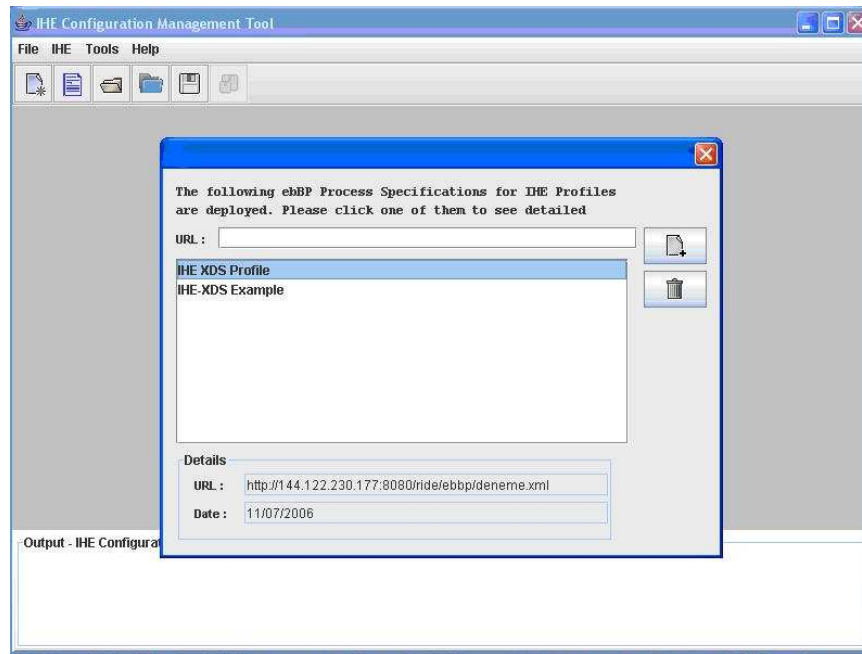


Figure 3.21: Introducing the ebBP definition of IHE profiles

3.3.1 IHE-CMT CPP Editor

An IHE CPP defines an IHE Actor's message exchange capabilities and the Business Collaborations that it supports. In order to define a CPP for an IHE Actor, the first step is to identify the IHE business process and the role of this Actor in this process as shown in Figure 3.22. Through this step, a system or application identifies which IHE Actor role it will play and also refers to the concrete IHE business process in which it will play this role. When the user click the "Next" button, the screen shown in Figure 3.23 is displayed where organizational information about the IHE Actor is provided. The Actor is assigned a unique identifier which cannot be modified. When the user moves to the next step as

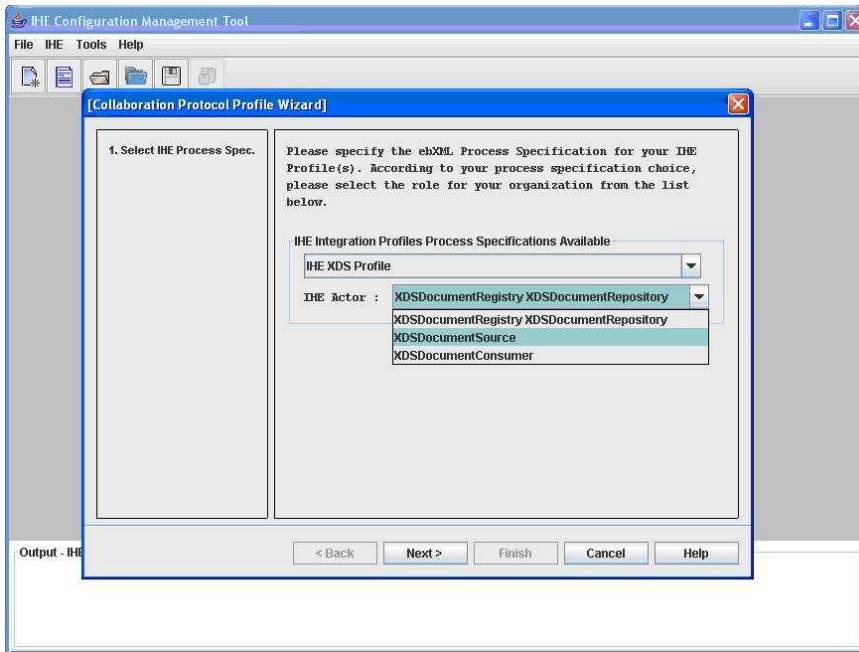


Figure 3.22: Selecting IHE Business Process and IHE Actor for Creating a CPP

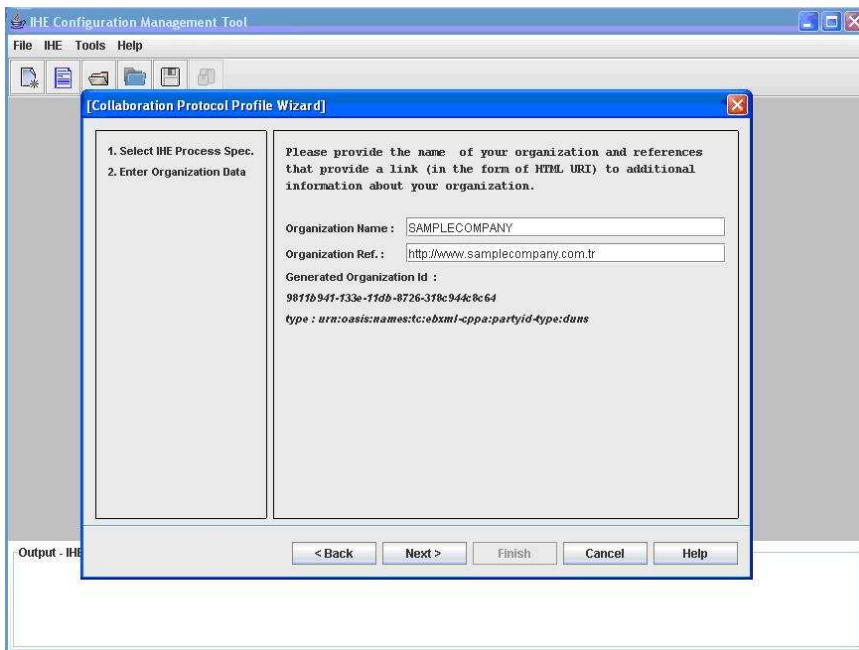


Figure 3.23: Providing organization information for CPP

shown in Figure 3.24, IHE-CPP Editor reads the selected process specification and validates it as follows: The process specification name, its URL, its Unique identifier and the Actor's role are displayed to the user for confirmation. Since these values will be used further down the process, this validation phase is just a double-check. In the next step as shown in Figure 3.25, the IHE Transactions

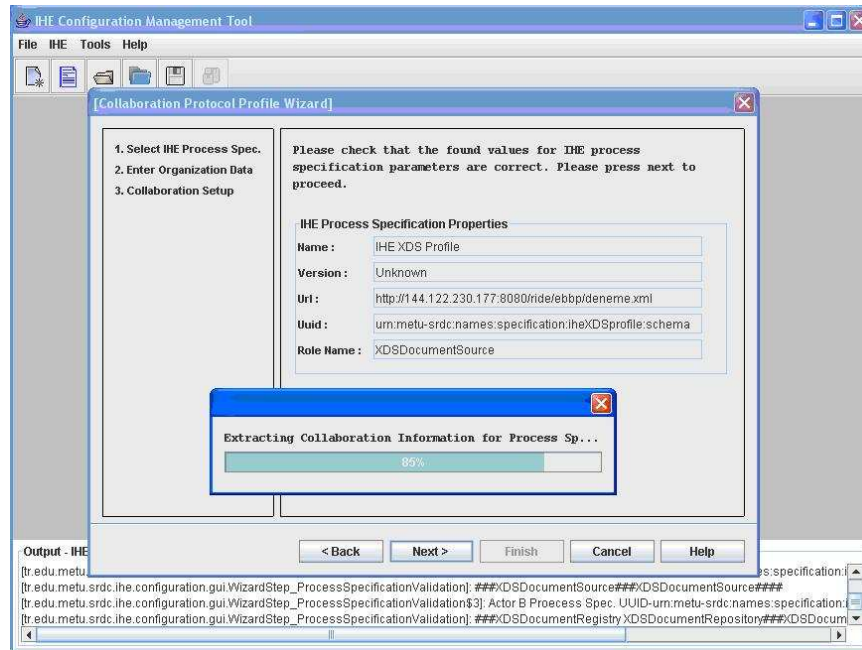


Figure 3.24: Validation of the IHE Process Specification Parameter Values

that this IHE Actor plays in the selected IHE business process is displayed to the user. The configuration parameters related with each displayed Transaction, e.g. Business Collaboration parameter values such as Actor's sending and receiving capabilities are extracted from the IHE Business Process and are automatically inserted into the Actor's CPP. In the next screen, the transport protocols for sending and receiving messages are set. For the selected protocol an end point address should be provided as shown in Figure 3.26. As a result of this step the CPP for the IHE Actor is created and can now be saved as shown in Figure 3.27. The interfaces described above are the steps of the IHE-CMT CPP Editor Wizard developed to facilitate IHE CPP creation. The IHE-CMT can also be used in the expert mode to edit in detail the created CPP if a need arises as

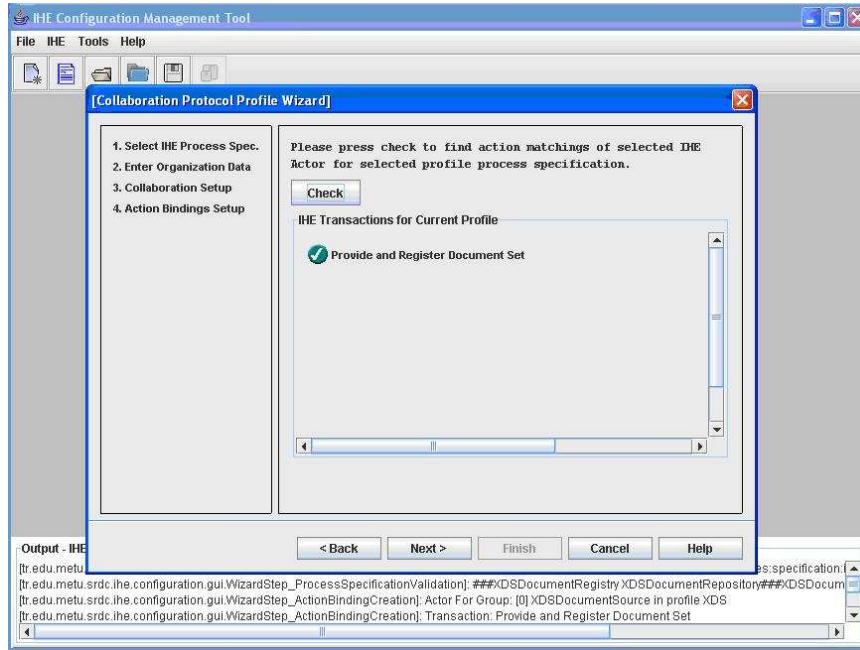


Figure 3.25: Extracting the Actor’s CPP Messaging Information from related IHE Business Process (Action Binding Setup)

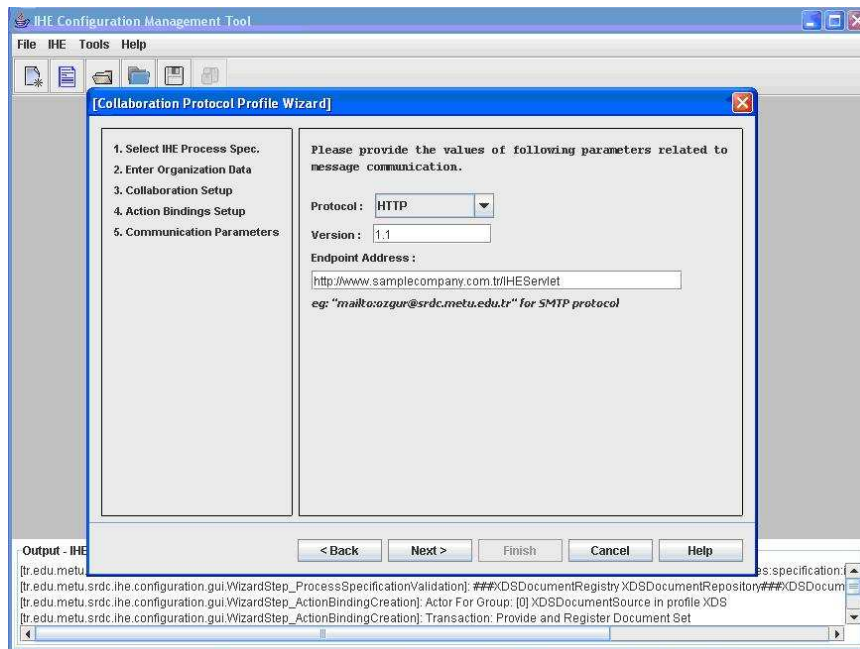


Figure 3.26: Setting the Communication Parameters for the Actor

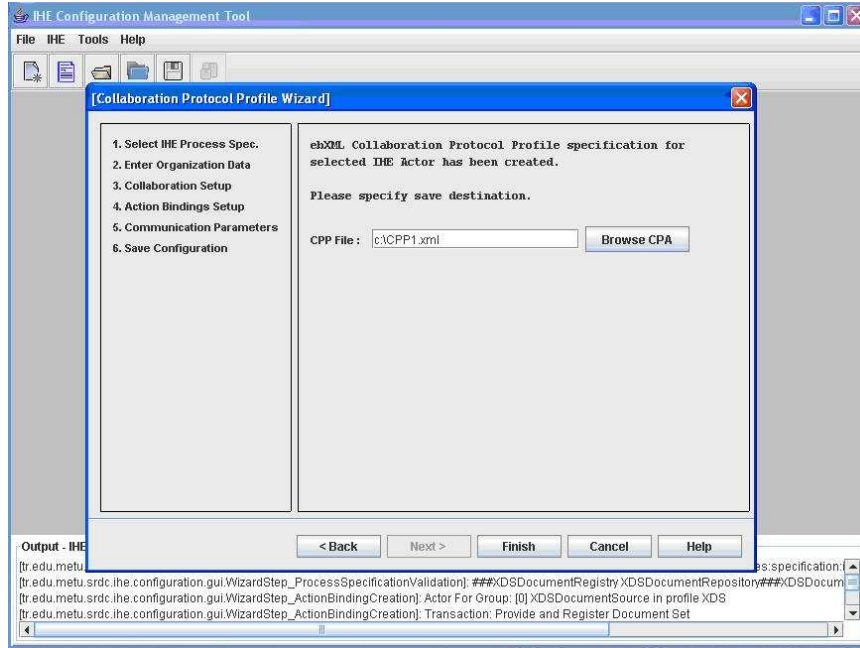


Figure 3.27: Saving the CPP Generated for the IHE Actor

shown in Figure 3.28.

Sample CPP document created by the IHE-CMT CPP editor can be found in Appendix D.

3.3.2 IHE-CMT CPA Editor

Since IHE fixes many of the parameters which are already stated in the ebBP definitions, which are imported to CPP definitions by the IHE-CMT CPP Editor, these are reused by the IHE-CMT CPA Editor. For example, the IHE Actor roles, the transactions, and the data exchanged among this set of choreographed IHE transactions are automatically reused by the IHE-CMT CPA Editor.

In order to facilitate the CPA formation process, a wizard, which guides the IHE Actors through this process, is incorporated into the IHE-CMT CPA configuration tool. The wizard is shown in Figure 3.29.

The CPA defines the configuration parameters for establishing an electronic relationship between two Actors in an IHE process specification (which can be a

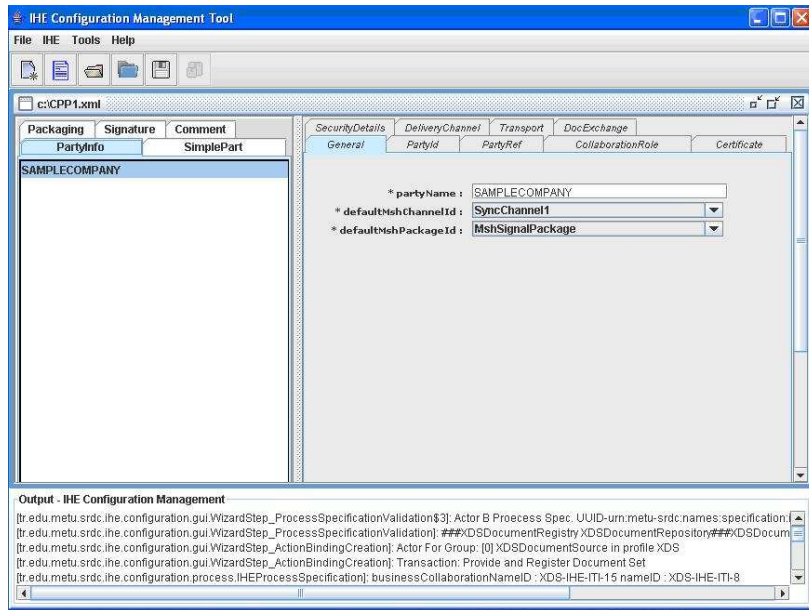


Figure 3.28: CPP Editor Expert Mode

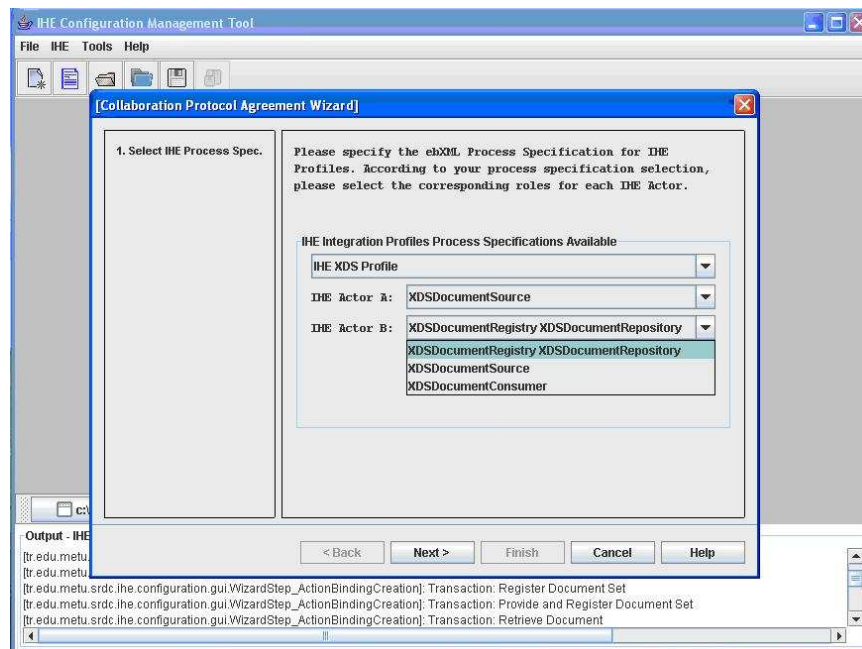


Figure 3.29: Selecting IHE Process Specification and roles

single IHE Profile or a business process describing a set of combined IHE Profiles obtained through Actor Grouping). The first step in CPA configuration tool wizard is selecting IHE process specification and the Actors involved. Figure 3.29 depicts the corresponding step of the IHE-CMT CPA configuration tool wizard.

The list of available process specifications is populated from the data repository of the IHE-CMT CPA configuration tool which contains the IHE process specifications. The IHE Actors involved are also displayed to the user. The user takes on the particular role that he is playing corresponding to an IHE Actor such as "XDSDocumentConsumer" from the Actor list displayed. As an example, in Figure 3.29, "XDSDocumentSource" is selected as IHE Actor A and "XDSDocumentRegistryXDSDocumentRepository" is selected as IHE Actor B. Note that "XDSDocumentRegistry XDSDocumentRepository" represents the grouped IHE Actors.

After this step, Wizard asks the user to enter or browse the CPP documents. Figure 3.30 shows how the CPP URLs are entered into the wizard. These CPP documents which are created by the CPP tool, contain information about capabilities of IHE Actors performing particular IHE transactions.

The tool reads the CPP specifications of each Actor and validates them. The validation test checks the syntax of document and the constraints of CPP schema such as availability of "PartyInfo" element. Also, CPAs need to guarantee that ID values in one CPP are distinct from the ID values in the other CPP so that no ID references collide when CPPs are merged. Therefore the CPA Tool checks the ID fields in two CPPs and updates the ID fields to prevent conflicts. This step is illustrated in Figure 3.31.

The tool further validates the selected IHE ebBP process specification and the Actors with the provided CPP specifications for each Actor. During validation, the tool checks whether the appropriate roles specified in the CPP exists in the ebBP definition. The validation process result is shown in Figure 3.24.

The matching roles are depicted to the user as shown in Figure 3.32; if there

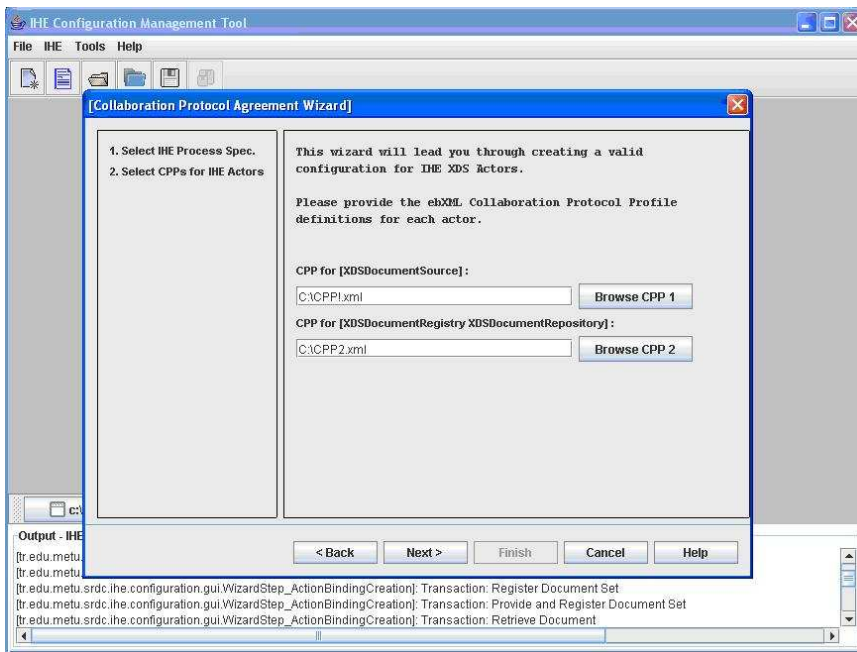


Figure 3.30: Selecting CPPs for IHE Actors

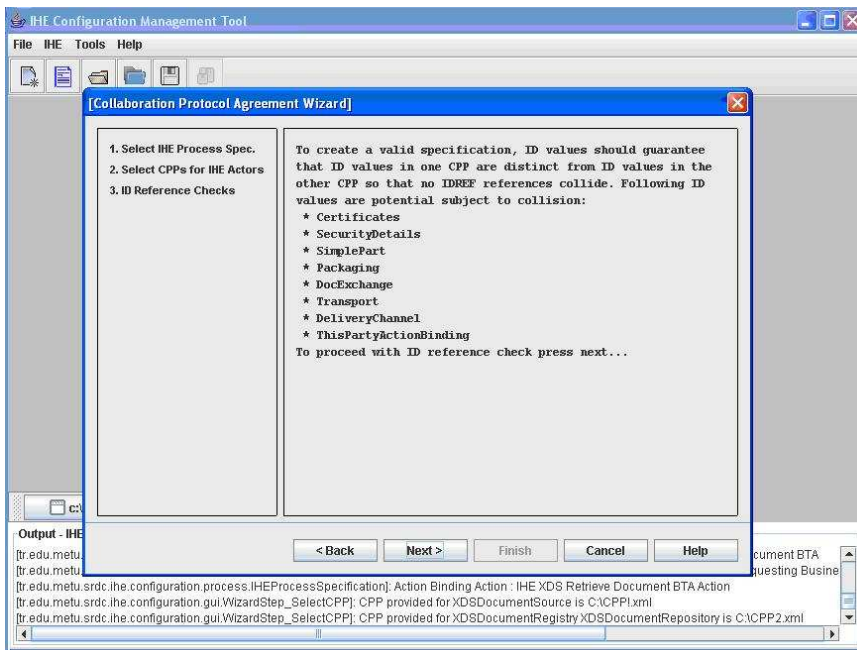


Figure 3.31: ID Reference Checking

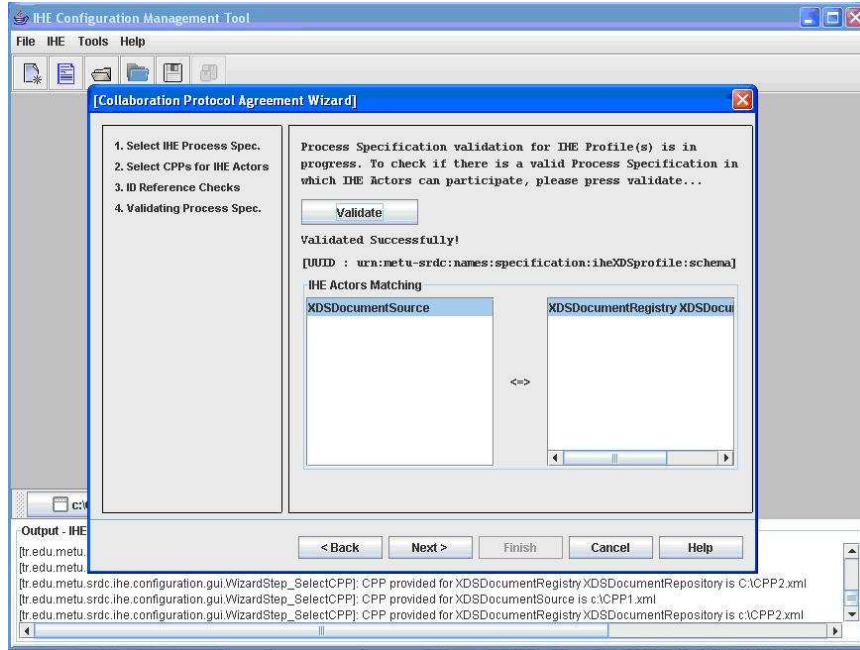


Figure 3.32: Validated Roles

are more than one possible role, the user selects the appropriate one.

In the next step, the CPP of each IHE Actor is checked to see whether they can realize the mandatory IHE transactions specified for its role. Note that a CPP refers to an ebBP definition which describes the IHE transactions that the Actor can play. What the tool further checks is whether the requesting Actor's sending capabilities (such as transport related parameters) matches the responding IHE Actor's receiving capabilities and vice-versa. This step is demonstrated in Figure 3.33.

There are a number of parameters in CPA that MAY be set if the user wishes to as shown in Figure 3.34. The user MAY just skip this step by pressing the "Next" button in which case the default place holder values are used. The "Status of Configuration" can be "Agreed", "Signed" or "Proposed". The "Configuration Lifetime", "Invocation Limit" and number of "Concurrent Conversations" can be specified. Finally, the IHE Configuration file is saved as shown in Figure 3.35.

CPA gives the all the details of configuration parameters for establishing

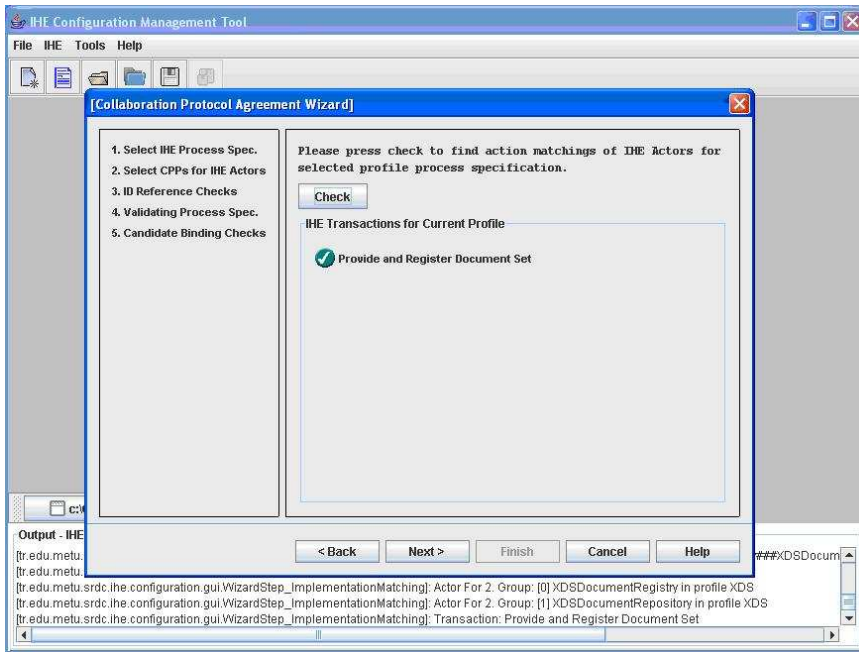


Figure 3.33: Candidate Binding Checking

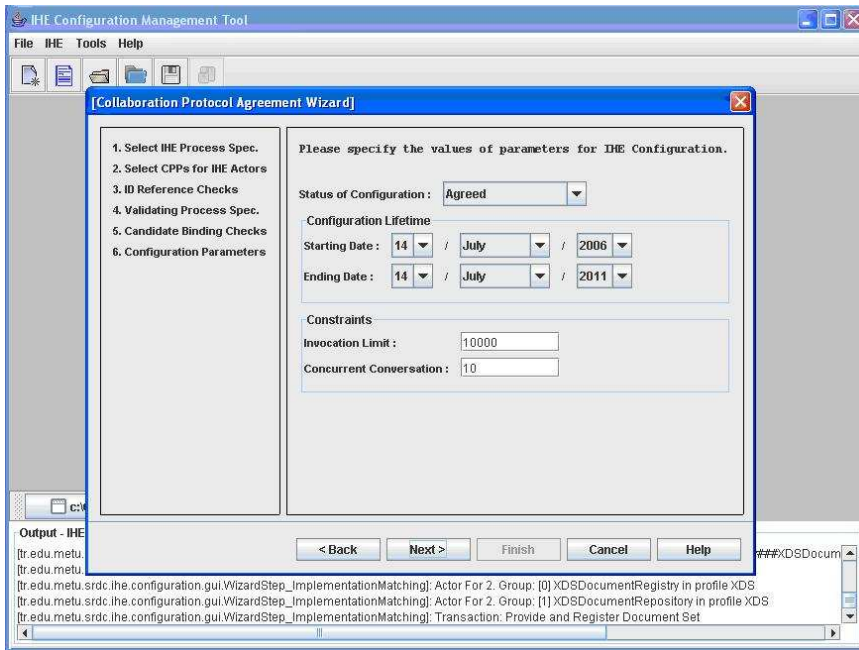


Figure 3.34: Configuration Parameters

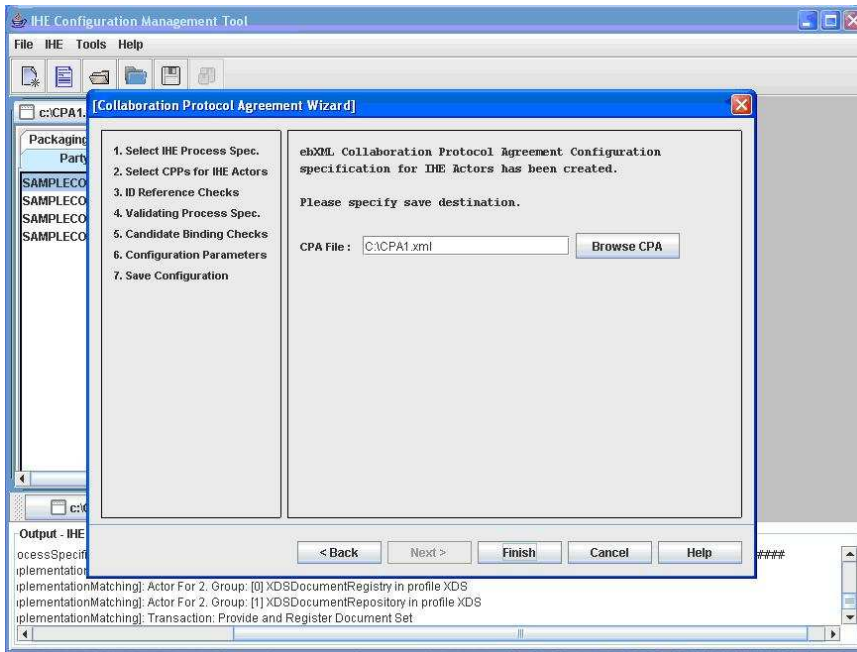


Figure 3.35: Saving IHE Configuration file

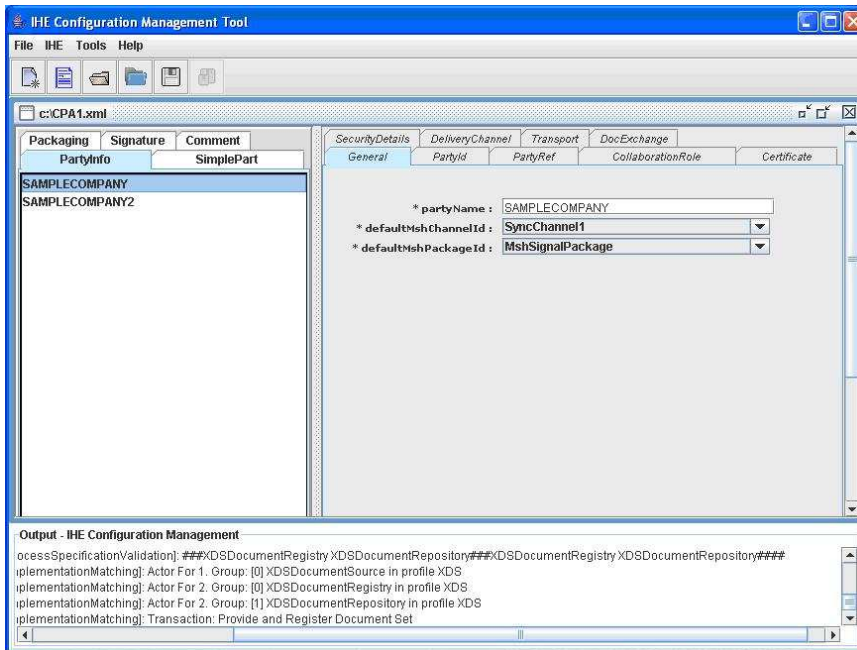


Figure 3.36: CPA Editor Expert Mode

electronic relationship between two IHE Actors in a given business collaboration. Hence, whenever such two Actors wishes to communicate, the electronic communication can be established automatically.

Sample CPA document created by the IHE-CMT CPA editor can be found in Appendix E.

CHAPTER 4

Virtual Connectathon Portal and IHE-CMT Integration

4.1 Introduction

In the today's connectathon events, participating organizations test their products using a toolkit called MESA[22]. The interoperability of the participating organizations is expected in each of connectathon tests. This interoperability measure can be performed only in connectathons with the participation of different IHE implementers. The tests cover individual IHE transactions, not the complete business scenario reflecting the real world environment. With the MESA Tools only individual transactions can be tested.

The main aim of the Virtual Connectathon Portal (VCP) is to enable the IHE product vendors and users to test their products through the web in any-time/anywhere manner. Basically, the vendors connect to the portal and create/join virtual connectathon rooms, where they can test a whole scenario. The key point in the portal is the connectathon rooms. The connectathon rooms are like internet conference rooms where participants can talk to each other.

The Virtual Connectathon Portal presented in this section is realized by Middle East Technical University Software Research and Development Center.

4.2 Log In/Out and New User Registration

VCP allows only registered users and the admin user to benefit from the functionalities of the portal. When a request from the users is made for access authorization, a standard procedure for granting permission, username and password matching, is followed. Login page is used for the authorization which is depicted in Figure 4.1.



Login	
Username:	admin
Password:	*****
<input type="button" value="Login"/> Not Registered Yet !!!	

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Figure 4.1: VCP Login Page

After logging in the VCP, the login information is stored in a session object; hence another login request will not be processed for the authorized IHE users.

A new user can register to the system via Register Page. From the Login Page, one can use "Not Registered Yet!!!" link next to "Login" button for registration issues. This link refers to Registration Page shown in Figure 4.2. After filling in the necessary fields and submitting this form to the VCP, the user can finalize the registration. All fields in this form are mandatory.

4.3 Virtual Connectathon Rooms

VCP introduces authorized users with Welcome Page. As it can be seen in Figure 4.3

The body of the Welcome Page is divided into two parts. In the left part, the aim of the VCP is described. The right part of the Welcome Page is comprised of two sections; Invited Rooms and Created Rooms sections. When the



Register Page

Register	
Username:	yildiray
Password:	*****
Re-Password:	*****
Name:	Yildiray
Surname:	Kabak
Organization Name:	METU-SRDC
E-mail:	yildiray@srcd.metu.edu
<input type="button" value="Register"/>	

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Figure 4.2: VCP Register Page



[Home](#) | [About](#) | [Contact Us](#)

Forum	Create	Tools	Schedule	Logs	Log out
IHE Virtual Connect-a-thon Portal				<input type="button" value="Invited Rooms"/>	
Welcome Umut Orhan				1-) Created on Tue Sep 12 10:36:27 EEST 2006 by METU-SRDC	
The main aim of the Virtual Connect-a-thon Portal (VCP) is to enable the IHE product vendors and users to test their products through the web anytime/anywhere. Basically, the vendors connects to the portal and create/join virtual connect-a-thon rooms, where they can test a whole scenario. The key point in the portal is the connect-a-thon rooms. The connect-a-thon rooms are like internet conference rooms where participants can talk to each other.				<input type="button" value="Created Rooms"/>	
				You have not created any room !!!...	

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Figure 4.3: VCP Welcome Page

organization of the IHE Actor is invited to a room which is not scheduled yet by the moderator, this room is listed in Invited Rooms section. If the user's organization is the moderator, i.e. creator, of a room, then the room is listed in the Created Rooms section. In both of these sections, there is a link to the room's viewing page; invited room view or created room view. Section 2.4 and Section 2.5 of this document present the invited room view pages and created room view pages respectively. After a room is scheduled by the room moderator, the link in the related section is removed.

Room creation page can be accessible from Create-Virtual Connectathon Room section on the navigation bar. In a Virtual Connectathon Room, in addition to individual business transactions, a whole scenario can also be tested. A scenario is modelled through a set of independent Business Collaborations. Mainly, in order to create the room, the user iteratively includes business collaborations in the existing business processes to the room. A room is created by room moderators, authorized users of the VCP who are willing to schedule a connectathon with other organizations. Figure 4.4 depicts the Room Creation Window.



Figure 4.4: VCP Room Creation Page

Creation of a Virtual Connect-a-thon room is finished after sending informative emails to invited organizations. If the invited organization accepts the invitation to the Connectathon room, then the organization submits its CPP to

the room through invited room view pages. After all invited organizations send their CPPs, the room moderator generates CPAs and schedules a time for the Connectathon. How to create and submit CPP and CPA are explained in the following section.

4.4 Integration of IHE-CMT to Virtual Connectathon Portal

In order to accept the invitation, the organizations need to submit their CPPs to the invited room. For submitting CPPs, the organizations can use Invited Room View page. From Welcome Page, which has an Invited Rooms section consisting of the links of the invited rooms, VCP users can access the rooms where they are invited. By clicking on the link of a room, Invited Room page is displayed, as shown in Figure 4.5.

VCP VIRTUAL CONNECT-A-THON PORTAL

Search

[Home](#) | [About](#) | [Contact Us](#)

Forum	Create	Tools	Schedule	Logs	Log out
-------	--------	-------	----------	------	---------

Virtual Connect-a-thon Room

Please create your Collaboration Protocol Profile (CPP) with the IHE Configuration Management Tool and submit it to the moderator by using the following form.

CPP Submission Form	
Business Process:	XDSDocumentSource <input type="button" value="Select BC"/>
CPP File:	<input type="text"/> <input type="button" value="Gozat..."/>
Role Name:	Local Secure Node <input type="button" value="Gozat..."/>
<input type="button" value="Submit"/>	Local Secure Node Remote Secure Node

You will obtain the Collaboration Protocol Agreement (CPA) to execute the business collaboration.

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ROOM DETAILS	
Created on	Mon Sep 18 11:47:30 EEST 2006
Scheduled on	Not Scheduled Yet!
Created by	IHE Product Vendor 1
<input type="button" value="Business Collaborations"/>	
1 process	ATNA-IHE-ITI-19
<input type="button" value="Role Assignments"/>	
1 Local Secure Node	METU-SRDC
1 Remote Secure Node	METU-SRDC
<input type="button" value="Submitted CPPs"/>	
<input type="button" value="Submitted CPAs"/>	

Figure 4.5: VCP Invited Room View

Invited organizations should submit separate CPPs for each role related with a business process. Available business process of the invited room is listed in "CPP Submission Form". Users can select business processes and the roles from

this form. Users then submit CPP file for this business process-role pair via this page.

Organizations generate their CPP files by using IHE-CMT. The user can access the IHE-CMT by clicking the "IHE Configuration Management Tool" link shown in Figure 4.5 or from the Tools menu as shown in Figure .

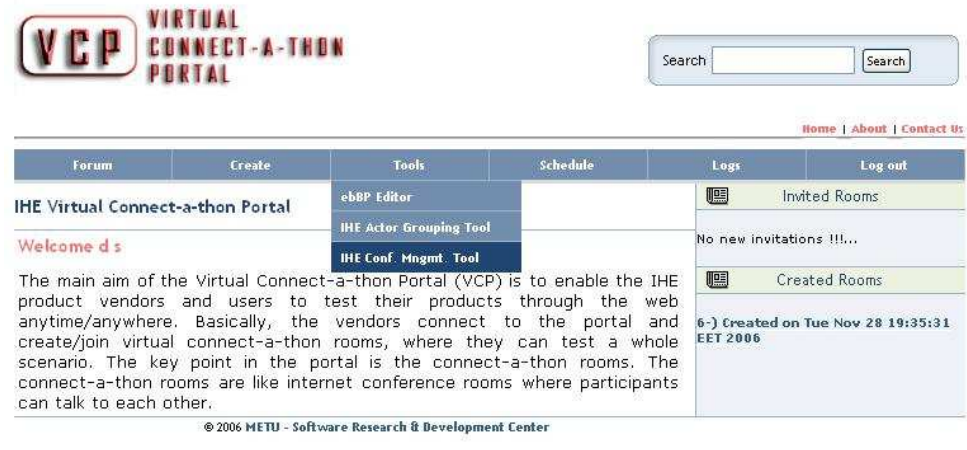


Figure 4.6: VCP Tools Menu

Room moderator should wait until all invited organizations accept the invitation, i.e. submit their CPPs. Note that, moderators can also invite their organizations to the room. In this case, "Participant Status" form in the Created Room page has the link in the Invited Organization section. From this link, moderators can access CPP submission form and send their CPPs to the room. When an invited organization sends all required CPPs, its status in the "Participant Status" form changes from "pending" to "accepted".

The next step is CPA submission phase. In this step, room moderator submits a CPA file which defines protocol agreements between two roles of a business process. CPAs can be generated by using IHE CMT. CPA Submission page is depicted Figure 4.7.

The last step for arranging a Virtual Connect-a-thon is scheduling the time of the event. Room moderator sets the Connectathon time after finishing CPA submission step.

VCP VIRTUAL CONNECT-A-THON PORTAL

Search

Home | About | Contact Us

Forum	Create	Tools	Schedule	Logs	Log out
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Virtual Connect-a-thon Room

Please create your Collaboration Protocol Agreements (CPA) between the organizations with the IHE Configuration Management Tool and submit it by using the following CPA submission form.

CPA Submission Form	
Business Process:	XSDocumentSource <input type="button" value="Select EC"/>
CPA File:	XSDocumentSource-PIXManager-ATNASecureNode.xml <input type="button" value="Go!"/>
From Role:	PIXPIDConsumer
To Role:	ATNAAuditRepository
<input type="button" value="Submit"/>	
<input type="button" value="Next"/>	

ROOM DETAILS	
Created on	Mon Sep 18 14:18:50 EEST 2006
Scheduled on	Not Scheduled Yet!
Created by	METU-SRDC
Business Collaborations	
1 process	ATNA-ITI-19-PIX-ITI-9-ATNA-ITI-20
Role Assignments	
1 PIXPIDConsumer	IHE Product Vendor 1
XSDocumentSource	
1 PIXManager	System
ATNASecureNode	
1 ATNAAuditRepository	METU-SRDC
Submitted CPPs	
1 ATNAAuditRepository	METU-SRDC
1 PIXPIDConsumer	IHE Product Vendor 1
XSDocumentSource	
1 PIXManager	System
ATNASecureNode	
Submitted CPAs	

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Figure 4.7: VCP CPA Submission

4.5 Implementation Details

The IHE-CMT is deployed to the portal as Java Web Start application. Java Web Start allows users to launch any client-side Java application by clicking on a link within a Web page. This technology encompasses portability of applets, maintainability of Servlets and Java Server Pages (JSP), and the simplicity of mark-up languages such as XML and HTML.[23]

To launch the IHE-CMT by Java Web Start, it must be installed on the client machine. If Java Web Start is not installed, the user will be prompted to download the program when s/he tries to launch the application. Deployment process of IHE-CMT is done afterwards.

CHAPTER 5

Related Work

ebXML itself is still very new, there is a lack of CPA formation knowledge i.e. the process to come to a CPA. The CPA formation process, which comprises the CPA composition process as well as the CPA negotiation process, has not been extensively investigated In [16], it is stated that:

”This specification defines and explains the contents of the CPP and CPA XML documents. Its scope is limited to these definitions. It does not define how to compose a CPA from two CPPs nor does it define anything related to run-time support for the CPP and CPA. It does include some non-normative suggestions and recommendations regarding CPA composition from two CPPs and run-time support where these notes serve to clarify the CPP and CPA definitions.”

[16] defines the concepts and technical details related to the ebXML CPP and CPA. A non-normative way is presented for the CPA formation process. No normative specification is provided for an algorithm for CPA formation, however, some guidance for implementers is provided. For CPP formation, [16] presents totally manual generic process that can be applied to any organization. In this thesis, the process is automated within several steps of CPP formation process using the IHE specific information.

[17] presents a detailed examination of the ebXML specification, Automated Negotiation of Collaboration Protocol Agreement Specification and ebXML CPA

Formation Research Results. It analyzes the various ebXML CPA formation specification documents. A prototype CPA formation implementation is mentioned. The detailed examination of specification by [17] enables realization of details that will effect the automation of CPA formation process and increase the speed.

The ebXML Trading Partner Agreement provides a key element for interoperability among B2B server implementations. [24] describes how the ebXML Trading Partner Specification defines technical parameters of trading partner profiles and agreements. [24] defines usage of CPA to do business. The high level middleware details are described but no computer aided partner agreement process is defined. [24] identifies the components needed in the middleware for automated configuration tool which will allow potential trading partners to negotiate an agreement and configure their IT systems to meet that agreement and interchange business information.

[25] presents the ebXML registry/repository concepts related to the CPP and CPA formation process. The non-normative suggestions within [16] are represented in pseudo-codes which aided the development of IHE Configuration Management Tool in this thesis.

[26] explains the today's global e-business infrastructure and its complex web of transactions and information exchange among several diverse organizations. It details the use of CPA as each organization interacts in a unique way with other organization. [26] examines ebXML specifications for details of how to support B2B integrations. [26] helps this thesis research during realization of real world applicability of CPPA using Java technologies.

The technical specification of IHE framework given in [2] is used to model interactions among the IHE Actors. IHE gives only definitions of the actor interactions. It does not provide or suggest means of representing information available in IHE IT Technical Framework. Considering this gap, ebBP is used to represent the interactions among the IHE Actors in a machine-processable way.

UN/CEFACT Modeling Methodology has been developed to analyze and design business-to-business processes independent of the underlying technology. It became the methodology of choice for developing ebXML business processes. [27] verifies UMM business collaboration representation with BPEL. As ebBP is based on UMM meta model, research provides the mapping to ebBP and gives a first evaluation to what extent UMM models can be transformed to BPEL. The research helps the thesis model underlying ebBP representations of IHE profiles and helps designing the architecture component based on web services.

[2] does not state any methodology to for the IHE Actors' business service interface description. For reaching interoperability, machine processable representation of IHE Actors' business service interfaces through ebXML Collaboration Protocol Profile and Agreement for automated configuration is presented in this thesis.

This research analyzes the relevant CPP and CPA formation ebXML specifications and tries to present a simplified and fast version specific for IHE Actors. This work has been influenced by emerging needs of healthcare service providers to automate the configuration of their software systems in their business environment.

CHAPTER 6

Conclusions and Future Work

As the healthcare business move more on web by the rapid improvements in the technology, it becomes important to automate the business transactions in the healthcare workflow to reduce the costs. Moreover, another important issue is the involvement of small companies in the business scenario. One of the key problems in health informatics is the lack of utilities for health application users and vendors to perform particular role in a real life scenario for interoperability measures.

IHE is an initiative by healthcare professionals and industry to improve the way computer systems in healthcare share information. Systems that support IHE Integration Profiles communicate better, are easier to implement, and enable care providers to use information more effectively. The goal is efficient delivery of optimal patient care. IHE Connectathons are annual events where vendors bring products with IHE Profiles and test them with other vendors. As technology develops faster and faster and the needs in healthcare domain increase day-by-day, IHE product users and vendors require connectathon tests frequently. Virtual Connectathon Portal provides the facilities to IHE product vendors to test their products in anytime/anywhere manner.

This research is conducted as a result of emerging needs of IHE actors to automate the configuration of their business service interfaces in connectathons. In

this thesis, research and development details of the IHE Configuration Management Tool is presented. The outputs of the research are demonstrated within the Virtual Connectathon Portal. The approach followed uses ebXML Collaboration Protocol Profile and Collaboration Protocol Agreement documents to automate the creation and exchange of configuration information between IHE Actors in a virtual connectathon environment. The CPP and CPA include the details of transport, messaging, document exchange protocols, security constraints and bindings to a ebBP Business Process Specification document that contains the definition of interactions between two IHE Actors. The CPP is used as description of the capabilities of individual IHE Actors. CPA is used as description of the capabilities that two actors have agreed to perform particular transaction in an IHE profile. CPA contains the configuration information which is consumed by the business service interface of each IHE Actor.

The Collaboration Protocol Profile and Agreement Specification Version 2.0 does not provide a solution for the formation of a CPAs from the CPPs. This research provides a CPA formation process, specifically designed for IHE transaction. Without a valid CPA there is no agreement and without an agreement there is no electronic business. The manual construction of the Collaboration Protocol Agreement documents between two businesses partners represented as IHE actors is replaced by automated Collaboration Protocol Agreement formation processes by the IHE-CMT. The ebXML CPA formation process specifications are very cautious to not claim that a fully automated CPA formation process is possible. The specifications mention sufficiently enough, that human intervention in the CPA formation process might be necessary. In this thesis, the human intervention is reduced dramatically. In conclusion, for a concrete business-to-business interaction, boot up process for the business service interfaces is very crucial, time and cost saving.

As future work, enhancements for the current CPA negotiation will be discussed, implemented and incorporated into the IHE-CMT. The CPA Configuration Tool is currently being improved to also handle the following issues:

- Signature: The generated CPA definition need to be digitally signed by one or both parties. This signing process is to ensure the agreement reached. XML digital signature specification must be used in the CPA definition. The validity tests will be done through the signatures provided by the Actors.
- CPA definition and Process Specification referred in CPPs contain attributes which are complementary. When a CPA is generated from the corresponding CPPs, the attributes present in the CPA must override the corresponding attributes defined in the ProcessSpecification. The information in the process specification can be updated after the generation of an agreement through CPA and the new process specification can be provided as a new version.

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APPENDIX A

CPP/A Configuration for IHE Profiles

The CPP/CPA specific information available in IHE Profiles is represented as machine processable XML documents for use in CPP/CPA Formation Process.

```
<?xml version="1.0" encoding="UTF-8"?> <CPPConfig
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:noNamespaceSchemaLocation="IHEConfigurationManagement/conf/ebcpp-config.xsd">
  <IHEActor name="Patient Identity Source" nameID="XDSPIDSource">
    <Transaction name="Patient Identity Feed"
      nameID="XDS-ITI-8" transactionNameID="IHE-ITI-8">
      <CanSend>RequestPackage</CanSend>
      <CanReceive>ReceiptAckPackage</CanReceive>
      <CanReceive>ReceiptAckExceptionPackage</CanReceive>
      <CanReceive>AcceptanceAckPackage</CanReceive>
    </Transaction>
  </IHEActor>
  <IHEActor name="Document Consumer" nameID="XDSDocumentConsumer">
    <Transaction name="Query Registry"
      nameID="XDS-ITI-16" transactionNameID="IHE-ITI-16">
      <CanSend>RequestPackage</CanSend>
      <CanSend>ReceiptAckPackage</CanSend>
      <CanSend>ReceiptAckExceptionPackage</CanSend>
      <CanReceive>ReceiptAckPackage</CanReceive>
      <CanReceive>ReceiptAckExceptionPackage</CanReceive>
      <CanReceive>AcceptanceAckPackage</CanReceive>
    </Transaction>
    <Transaction name="Retrieve Document"
      nameID="XDS-ITI-17" transactionNameID="IHE-ITI-17">
      <CanSend>RequestPackage</CanSend>
      <CanSend>ReceiptAckPackage</CanSend>
      <CanSend>ReceiptAckExceptionPackage</CanSend>
      <CanReceive>ReceiptAckPackage</CanReceive>
      <CanReceive>ReceiptAckExceptionPackage</CanReceive>
      <CanReceive>AcceptanceAckPackage</CanReceive>
    </Transaction>
  </IHEActor>
  <IHEActor name="Document Source" nameID="XDSDocumentSource">
    <Transaction name="Provide and Register Document Set"
      nameID="XDS-ITI-15" transactionNameID="IHE-ITI-15">
      <CanSend>RequestPackage</CanSend>
      <CanSend>ReceiptAckPackage</CanSend>
      <CanSend>ReceiptAckExceptionPackage</CanSend>
      <CanSend>AcceptanceAckPackage</CanSend>
      <CanReceive>RequestPackage</CanReceive>
      <CanReceive>ReceiptAckPackage</CanReceive>
      <CanReceive>ReceiptAckExceptionPackage</CanReceive>
      <CanReceive>AcceptanceAckPackage</CanReceive>
    </Transaction>
  </IHEActor>
  <IHEActor name="Document Registry" nameID="XDSDocumentRegistry">
```

```

<Transaction name="Patient Identity Feed"
nameID="XDS-ITI-8" transactionNameID="IHE-ITI-8">
  <CanSend>ReceiptAckPackage</CanSend>
  <CanSend>ReceiptAckExceptionPackage</CanSend>
  <CanSend>AcceptanceAckPackage</CanSend>
  <CanReceive>RequestPackage</CanReceive>
</Transaction>
<Transaction name="Register Document Set"
nameID="XDS-ITI-14" transactionNameID="IHE-ITI-14">
  <CanSend>RequestPackage</CanSend>
  <CanSend>ReceiptAckPackage</CanSend>
  <CanSend>ReceiptAckExceptionPackage</CanSend>
  <CanSend>AcceptanceAckPackage</CanSend>
  <CanReceive>RequestPackage</CanReceive>
  <CanReceive>ReceiptAckPackage</CanReceive>
  <CanReceive>ReceiptAckExceptionPackage</CanReceive>
  <CanReceive>AcceptanceAckPackage</CanReceive>
</Transaction>
<Transaction name="Query Registry"
nameID="XDS-ITI-16" transactionNameID="IHE-ITI-16">
  <CanSend>RequestPackage</CanSend>
  <CanSend>ReceiptAckPackage</CanSend>
  <CanSend>ReceiptAckExceptionPackage</CanSend>
  <CanReceive>RequestPackage</CanReceive>
  <CanReceive>ReceiptAckPackage</CanReceive>
  <CanReceive>ReceiptAckExceptionPackage</CanReceive>
</Transaction>
</IHEActor>
<IHEActor name="Document Repository" nameID="XDSDocumentRepository">
  <Transaction name="Register Document Set"
nameID="XDS-ITI-14" transactionNameID="IHE-ITI-14">
    <CanSend>RequestPackage</CanSend>
    <CanSend>ReceiptAckPackage</CanSend>
    <CanSend>ReceiptAckExceptionPackage</CanSend>
    <CanSend>AcceptanceAckPackage</CanSend>
    <CanReceive>RequestPackage</CanReceive>
    <CanReceive>ReceiptAckPackage</CanReceive>
    <CanReceive>ReceiptAckExceptionPackage</CanReceive>
    <CanReceive>AcceptanceAckPackage</CanReceive>
  </Transaction>
  <Transaction name="Provide and Register Document Set"
nameID="XDS-ITI-15" transactionNameID="IHE-ITI-15">
    <CanSend>RequestPackage</CanSend>
    <CanSend>ReceiptAckPackage</CanSend>
    <CanSend>ReceiptAckExceptionPackage</CanSend>
    <CanSend>AcceptanceAckPackage</CanSend>
    <CanReceive>RequestPackage</CanReceive>
    <CanReceive>ReceiptAckPackage</CanReceive>
    <CanReceive>ReceiptAckExceptionPackage</CanReceive>
    <CanReceive>AcceptanceAckPackage</CanReceive>
  </Transaction>
  <Transaction name="Retrieve Document"
nameID="XDS-ITI-17" transactionNameID="IHE-ITI-17">
    <CanSend>RequestPackage</CanSend>
    <CanSend>ReceiptAckPackage</CanSend>
    <CanSend>ReceiptAckExceptionPackage</CanSend>
    <CanReceive>RequestPackage</CanReceive>
    <CanReceive>ReceiptAckPackage</CanReceive>
    <CanReceive>ReceiptAckExceptionPackage</CanReceive>
  </Transaction>
</IHEActor>
<IHEActor name="Patient Identity Source" nameID="PIXPIDSource">
  <Transaction name="Patient Identity Feed"
nameID="PIX-ITI-8" transactionNameID="IHE-ITI-8">
    <CanSend>RequestPackage</CanSend>
    <CanReceive>ReceiptAckPackage</CanReceive>
    <CanReceive>ReceiptAckExceptionPackage</CanReceive>
    <CanReceive>AcceptanceAckPackage</CanReceive>
  </Transaction>
</IHEActor>
<IHEActor name="Patient Identifier Cross-reference Consumer" nameID="PIXPIDConsumer">
  <Transaction name="PIX Query"
nameID="PIX-ITI-9" transactionNameID="IHE-ITI-9">
    <CanSend>RequestPackage</CanSend>
    <CanSend>ReceiptAckPackage</CanSend>
    <CanSend>ReceiptAckExceptionPackage</CanSend>
    <CanReceive>RequestPackage</CanReceive>
    <CanReceive>ReceiptAckPackage</CanReceive>
    <CanReceive>ReceiptAckExceptionPackage</CanReceive>
  </Transaction>
  <Transaction name="PIX Update Notification"
nameID="PIX-ITI-10" transactionNameID="IHE-ITI-10">
    <CanSend>RequestPackage</CanSend>

```

```

        <CanReceive>ReceiptAckPackage</CanReceive>
        <CanReceive>ReceiptAckExceptionPackage</CanReceive>
        <CanReceive>AcceptanceAckPackage</CanReceive>
    </Transaction>
</IHEActor>
<IHEActor name="Patient Identifier Cross-reference Manager" nameID="PIXManager">
    <Transaction name="Patient Identity Feed"
    nameID="PIX-ITI-8" transactionNameID="IHE-ITI-8">
        <CanSend>ReceiptAckPackage</CanSend>
        <CanSend>ReceiptAckExceptionPackage</CanSend>
        <CanSend>AcceptanceAckPackage</CanSend>
        <CanReceive>RequestPackage</CanReceive>
    </Transaction>
    <Transaction name="PIX Query"
    nameID="PIX-ITI-9" transactionNameID="IHE-ITI-9">
        <CanSend>RequestPackage</CanSend>
        <CanSend>ReceiptAckPackage</CanSend>
        <CanSend>ReceiptAckExceptionPackage</CanSend>
        <CanReceive>RequestPackage</CanReceive>
        <CanReceive>ReceiptAckPackage</CanReceive>
        <CanReceive>ReceiptAckExceptionPackage</CanReceive>
    </Transaction>
    <Transaction name="PIX Update Notification"
    nameID="PIX-ITI-10" transactionNameID="IHE-ITI-10">
        <CanSend>ReceiptAckPackage</CanSend>
        <CanSend>ReceiptAckExceptionPackage</CanSend>
        <CanSend>AcceptanceAckPackage</CanSend>
        <CanReceive>RequestPackage</CanReceive>
    </Transaction>
</IHEActor>
<IHEActor name="Time Server" nameID="ATNATimeServer">
    <Transaction name="Maintain Time"
    nameID="ATNA-ITI-1" transactionNameID="IHE-ITI-1">
        <CanSend>RequestPackage</CanSend>
        <CanSend>ReceiptAckPackage</CanSend>
        <CanSend>ReceiptAckExceptionPackage</CanSend>
        <CanReceive>RequestPackage</CanReceive>
        <CanReceive>ReceiptAckPackage</CanReceive>
        <CanReceive>ReceiptAckExceptionPackage</CanReceive>
    </Transaction>
</IHEActor>
<IHEActor name="Secure Node" nameID="ATNASecureNode">
    <Transaction name="Node Authentication"
    nameID="ATNA-ITI-19" transactionNameID="IHE-ITI-19">
        <CanSend>RequestPackage</CanSend>
        <CanSend>ReceiptAckPackage</CanSend>
        <CanSend>ReceiptAckExceptionPackage</CanSend>
        <CanReceive>RequestPackage</CanReceive>
        <CanReceive>ReceiptAckPackage</CanReceive>
        <CanReceive>ReceiptAckExceptionPackage</CanReceive>
    </Transaction>
    <Transaction name="Record Audit Event"
    nameID="ATNA-ITI-20" transactionNameID="IHE-ITI-20">
        <CanSend>RequestPackage</CanSend>
        <CanReceive>ReceiptAckPackage</CanReceive>
        <CanReceive>ReceiptAckExceptionPackage</CanReceive>
        <CanReceive>AcceptanceAckPackage</CanReceive>
    </Transaction>
    <Transaction name="Maintain Time"
    nameID="ATNA-ITI-1" transactionNameID="IHE-ITI-1">
        <CanSend>RequestPackage</CanSend>
        <CanSend>ReceiptAckPackage</CanSend>
        <CanSend>ReceiptAckExceptionPackage</CanSend>
        <CanReceive>RequestPackage</CanReceive>
        <CanReceive>ReceiptAckPackage</CanReceive>
        <CanReceive>ReceiptAckExceptionPackage</CanReceive>
    </Transaction>
</IHEActor>
<IHEActor name="Audit Repository" nameID="ATNAAuditRepository">
    <Transaction name="Record Audit Event"
    nameID="ATNA-ITI-20" transactionNameID="IHE-ITI-20">
        <CanSend>ReceiptAckPackage</CanSend>
        <CanSend>ReceiptAckExceptionPackage</CanSend>
        <CanSend>AcceptanceAckPackage</CanSend>
        <CanReceive>RequestPackage</CanReceive>
    </Transaction>
</IHEActor>
<IHEActor name="X-Service Provider" nameID="XServiceProvider">
    <Transaction name="Authentication Request"
    nameID="XUA-ITI-29-A" transactionNameID="IHE-ITI-29-AReqA">
        <CanSend>RequestPackage</CanSend>
        <CanReceive>ReceiptAckPackage</CanReceive>
        <CanReceive>ReceiptAckExceptionPackage</CanReceive>
        <CanReceive>AcceptanceAckPackage</CanReceive>

```

```

</Transaction>
<Transaction name="Authentication Response"
nameID="XUA-ITI-29-D" transactionNameID="IHE-ITI-29-AResD">
  <CanSend>ReceiptAckPackage</CanSend>
  <CanSend>ReceiptAckExceptionPackage</CanSend>
  <CanSend>AcceptanceAckPackage</CanSend>
  <CanReceive>RequestPackage</CanReceive>
</Transaction>
</IHEActor>
<IHEActor name="X-Service User" nameID="XServiceUser">
  <Transaction name="Authentication Request"
nameID="XUA-ITI-29-A" transactionNameID="IHE-ITI-29-AReqA">
    <CanSend>ReceiptAckPackage</CanSend>
    <CanSend>ReceiptAckExceptionPackage</CanSend>
    <CanSend>AcceptanceAckPackage</CanSend>
    <CanReceive>RequestPackage</CanReceive>
  </Transaction>
  <Transaction name="Authentication Request"
nameID="XUA-ITI-29-B" transactionNameID="IHE-ITI-29-AReqB">
    <CanSend>RequestPackage</CanSend>
    <CanReceive>ReceiptAckPackage</CanReceive>
    <CanReceive>ReceiptAckExceptionPackage</CanReceive>
    <CanReceive>AcceptanceAckPackage</CanReceive>
  </Transaction>
  <Transaction name="Authentication Response"
nameID="XUA-ITI-29-C" transactionNameID="IHE-ITI-29-AResC">
    <CanSend>ReceiptAckPackage</CanSend>
    <CanSend>ReceiptAckExceptionPackage</CanSend>
    <CanSend>AcceptanceAckPackage</CanSend>
    <CanReceive>RequestPackage</CanReceive>
  </Transaction>
  <Transaction name="Authentication Response"
nameID="XUA-ITI-29-D" transactionNameID="IHE-ITI-29-AResD">
    <CanSend>RequestPackage</CanSend>
    <CanReceive>ReceiptAckPackage</CanReceive>
    <CanReceive>ReceiptAckExceptionPackage</CanReceive>
    <CanReceive>AcceptanceAckPackage</CanReceive>
  </Transaction>
</IHEActor>
<IHEActor name="X-Identity Provider" nameID="XIdentityProvider">
  <Transaction name="Authentication Request"
nameID="XUA-ITI-29-B" transactionNameID="IHE-ITI-29-AReqB">
    <CanSend>ReceiptAckPackage</CanSend>
    <CanSend>ReceiptAckExceptionPackage</CanSend>
    <CanSend>AcceptanceAckPackage</CanSend>
    <CanReceive>RequestPackage</CanReceive>
  </Transaction>
  <Transaction name="Authentication Response"
nameID="XUA-ITI-29-C" transactionNameID="IHE-ITI-29-AResC">
    <CanSend>RequestPackage</CanSend>
    <CanReceive>ReceiptAckPackage</CanReceive>
    <CanReceive>ReceiptAckExceptionPackage</CanReceive>
    <CanReceive>AcceptanceAckPackage</CanReceive>
  </Transaction>
</IHEActor>
</CPPConfig>

```

APPENDIX B

EBBP Configuration for IHE Profiles

The ebBP specific information available in IHE Profiles is represented as machine processable XML documents for use in CPP/CPA Formation Process.

```
<?xml version="1.0" encoding="UTF-8"?> <EBBPDomainsConfig>
  <Domain name="Integrating Healthcare Enterprise" nameID="IHE">
    <Profile name="Cross-Enterprise Document Sharing" nameID="XDS">
      <Actors>
        <Actor name="Patient Identity Source" nameID="XDSPIDSource"/>
        <Actor name="Document Consumer" nameID="XSDDocumentConsumer"/>
        <Actor name="Document Source" nameID="XSDDocumentSource"/>
        <Actor name="Document Registry" nameID="XSDDocumentRegistry"/>
        <Actor name="Document Repository" nameID="XSDDocumentRepository"/>
      </Actors>
      <Transactions>
        <Transaction
          href="http://localhost:8080/packages/businessCollaborations/
            IHE-IndividualBC-XDS-IHE-ITI-8-25052006-v1.xml"
          initiatingActorRef="XDSPIDSource"
          name="Patient Identity Feed" nameID="XDS-ITI-8" respondingActorRef="XSDDocumentRegistry"/>
        <Transaction
          href="http://localhost:8080/packages/businessCollaborations/
            IHE-IndividualBC-IHE-ITI-14-25052006-v1.xml"
          initiatingActorRef="XSDDocumentRepository"
          name="Register Document Set" nameID="XDS-ITI-14" respondingActorRef="XSDDocumentRegistry"/>
        <Transaction
          href="http://localhost:8080/packages/businessCollaborations/
            IHE-IndividualBC-IHE-ITI-15-25052006-v1.xml"
          initiatingActorRef="XSDDocumentSource"
          name="Provide and Register Document Set"
          nameID="XDS-ITI-15" respondingActorRef="XSDDocumentRepository"/>
        <Transaction
          href="http://localhost:8080/packages/businessCollaborations/
            IHE-IndividualBC-IHE-ITI-16-25052006-v1.xml"
          initiatingActorRef="XSDDocumentConsumer"
          name="Query Registry" nameID="XDS-ITI-16" respondingActorRef="XSDDocumentRegistry"/>
        <Transaction
          href="http://localhost:8080/packages/businessCollaborations/
            IHE-IndividualBC-IHE-ITI-17-25052006-v1.xml"
          initiatingActorRef="XSDDocumentConsumer"
          name="Retrieve Document" nameID="XDS-ITI-17" respondingActorRef="XSDDocumentRepository"/>
      </Transactions>
    </Profile>
    <Profile name="Patient Identifier Cross-referencing" nameID="PIX">
      <Actors>
        <Actor name="Patient Identity Source" nameID="PIXPIDSource"/>
        <Actor
          name="Patient Identifier Cross-reference Consumer" nameID="PIXPIDConsumer"/>
        <Actor name="Patient Identifier Cross-reference Manager" nameID="PIXManager"/>
      </Actors>
      <Transactions>
        <Transaction
```

```

href="http://localhost:8080/packages/businessCollaborations/
IHE-IndividualBC-PIX-IHE-ITI-8-25052006-v1.xml"
initiatingActorRef="PIXPIDSource"
name="Patient Identity Feed" nameID="PIX-ITI-8" respondingActorRef="PIXManager"/>
<Transaction
href="http://localhost:8080/packages/businessCollaborations/
IHE-IndividualBC-IHE-ITI-9-25052006-v1.xml"
initiatingActorRef="PIXPIDConsumer" name="PIX Query"
nameID="PIX-ITI-9" respondingActorRef="PIXManager"/>
<Transaction
href="http://localhost:8080/packages/businessCollaborations/
IHE-IndividualBC-IHE-ITI-10-25052006-v1.xml"
initiatingActorRef="PIXManager"
name="PIX Update Notification" nameID="PIX-ITI-10" respondingActorRef="PIXPIDConsumer"/>
</Transactions>
</Profile>
<Profile name="Audit Trail and Node Authentication" nameID="ATNA">
<Actors>
<Actor name="Time Server" nameID="ATNATimeServer"/>
<Actor name="Secure Node" nameID="ATNASecureNode"/>
<Actor name="Audit Repository" nameID="ATNAAuditRepository"/>
</Actors>
<Transactions>
<Transaction
href="http://localhost:8080/packages/businessCollaborations/
IHE-IndividualBC-IHE-ITI-19-25052006-v1.xml"
initiatingActorRef="ATNASecureNode"
name="Node Authentication" nameID="ATNA-ITI-19" respondingActorRef="ATNASecureNode"/>
<Transaction
href="http://localhost:8080/packages/businessCollaborations/
IHE-IndividualBC-IHE-ITI-20-25052006-v1.xml"
initiatingActorRef="ATNASecureNode"
name="Record Audit Event" nameID="ATNA-ITI-20" respondingActorRef="ATNAAuditRepository"/>
<Transaction
href="http://localhost:8080/packages/businessCollaborations/
IHE-IndividualBC-IHE-ITI-1-25052006-v1.xml"
initiatingActorRef="ATNASecureNode"
name="Maintain Time" nameID="ATNA-ITI-1" respondingActorRef="ATNATimeServer"/>
</Transactions>
</Profile>
<Profile name="Cross-Enterprise User Authentication" nameID="XUA">
<Actors>
<Actor name="X-Service Provider" nameID="XServiceProvider"/>
<Actor name="X-Service User" nameID="XServiceUser"/>
<Actor name="X-Identity Provider" nameID="XIdentityProvider"/>
</Actors>
<Transactions>
<Transaction
href="http://localhost:8080/packages/businessCollaborations/
IHE-IndividualBC-XUA-IHE-ITI-29-AReqA-07092006-v1.xml"
initiatingActorRef="XServiceProvider"
name="Authentication Request" nameID="XUA-ITI-29-A" respondingActorRef="XServiceUser"/>
<Transaction
href="http://localhost:8080/packages/businessCollaborations/
IHE-IndividualBC-XUA-IHE-ITI-29-AReqB-07092006-v1.xml"
initiatingActorRef="XServiceUser"
name="Authentication Request" nameID="XUA-ITI-29-B" respondingActorRef="XIdentityProvider"/>
<Transaction
href="http://localhost:8080/packages/businessCollaborations/
IHE-IndividualBC-XUA-IHE-ITI-29-AResC-07092006-v1.xml"
initiatingActorRef="XIdentityProvider"
name="Authentication Response" nameID="XUA-ITI-29-C" respondingActorRef="XServiceUser"/>
<Transaction
href="http://localhost:8080/packages/businessCollaborations/
IHE-IndividualBC-XUA-IHE-ITI-29-AResD-07092006-v1.xml"
initiatingActorRef="XServiceUser"
name="Authentication Response" nameID="XUA-ITI-29-D" respondingActorRef="XServiceProvider"/>
</Transactions>
</Profile>
<Rules>
<GroupingRules>
<Rule nameID="Rule1" sourceActorRef="XDSDocumentSource" targetActorRef="ATNASecureNode">
<Precedes
sourceInitiatingRoleRef="XDSDocumentSource"
sourceTransactionRef="ATNA-ITI-19"
sourceRespondingRoleRef="XDSDocumentRepository"
targetInitiatingRoleRef="XDSDocumentSource"
targetTransactionRef="XDS-ITI-15"
targetRespondingRoleRef="XDSDocumentRepository"/>
</Rule>
<Rule nameID="Rule11" sourceActorRef="XDSPIDSource" targetActorRef="ATNASecureNode">
<Precedes
sourceInitiatingRoleRef="XDSDocumentSource"
sourceTransactionRef="ATNA-ITI-19"
sourceRespondingRoleRef="XDSDocumentRegistry"
targetInitiatingRoleRef="XDSDocumentSource"
targetTransactionRef="XDS-ITI-8"
targetRespondingRoleRef="XDSDocumentRegistry"/>
<Precedes

```



```

        sourceInitiatingRoleRef="XSDDocumentSource"
        sourceTransactionRef="XDS-ITI-8"
        sourceRespondingRoleRef="XSDDocumentRegistry"
        targetInitiatingRoleRef="XSDDocumentRegistry"
        targetTransactionRef="ATNA-ITI-20"
        targetRespondingRoleRef="ATNAAuditRepository"/>
</Rule>
<Rule nameID="Rule13" sourceActorRef="PIXPIDSource" targetActorRef="ATNASecureNode">
  <Precedes
    sourceInitiatingRoleRef="XSDDocumentConsumer"
    sourceTransactionRef="ATNA-ITI-19"
    sourceRespondingRoleRef="PIXManager"
    targetInitiatingRoleRef="XSDDocumentConsumer"
    targetTransactionRef="PIX-ITI-8"
    targetRespondingRoleRef="PIXManager"/>
  <Precedes
    sourceInitiatingRoleRef="XSDDocumentConsumer"
    sourceTransactionRef="PIX-ITI-8"
    sourceRespondingRoleRef="PIXManager"
    targetInitiatingRoleRef="PIXManager"
    targetTransactionRef="ATNA-ITI-20"
    targetRespondingRoleRef="ATNAAuditRepository"/>
</Rule>
<Rule nameID="Rule2"
  sourceActorRef="XSDDocumentRepository" targetActorRef="ATNASecureNode">
  <Precedes
    sourceInitiatingRoleRef="XSDDocumentSource"
    sourceTransactionRef="ATNA-ITI-19"
    sourceRespondingRoleRef="XSDDocumentRepository"
    targetInitiatingRoleRef="XSDDocumentSource"
    targetTransactionRef="XDS-ITI-15"
    targetRespondingRoleRef="XSDDocumentRepository"/>
  <Precedes
    sourceInitiatingRoleRef="XSDDocumentSource"
    sourceTransactionRef="XDS-ITI-15"
    sourceRespondingRoleRef="XSDDocumentRepository"
    targetInitiatingRoleRef="XSDDocumentRepository"
    targetTransactionRef="ATNA-ITI-20"
    targetRespondingRoleRef="ATNAAuditRepository"/>
  <Precedes
    sourceInitiatingRoleRef="XSDDocumentRepository"
    sourceTransactionRef="ATNA-ITI-19"
    sourceRespondingRoleRef="XSDDocumentRegistry"
    targetInitiatingRoleRef="XSDDocumentRepository"
    targetTransactionRef="XDS-ITI-14"
    targetRespondingRoleRef="XSDDocumentRegistry"/>
  <Precedes
    sourceInitiatingRoleRef="XSDDocumentConsumer"
    sourceTransactionRef="ATNA-ITI-19"
    sourceRespondingRoleRef="XSDDocumentRepository"
    targetInitiatingRoleRef="XSDDocumentConsumer"
    targetTransactionRef="XDS-ITI-17"
    targetRespondingRoleRef="XSDDocumentRepository"/>
  <Precedes
    sourceInitiatingRoleRef="XSDDocumentConsumer"
    sourceTransactionRef="XDS-ITI-17"
    sourceRespondingRoleRef="XSDDocumentRepository"
    targetInitiatingRoleRef="XSDDocumentRepository"
    targetTransactionRef="ATNA-ITI-20"
    targetRespondingRoleRef="ATNAAuditRepository"/>
</Rule>
<Rule nameID="Rule3"
  sourceActorRef="XSDDocumentRegistry" targetActorRef="ATNASecureNode">
  <Precedes
    sourceInitiatingRoleRef="XSDDocumentRepository"
    sourceTransactionRef="ATNA-ITI-19"
    sourceRespondingRoleRef="XSDDocumentRegistry"
    targetInitiatingRoleRef="XSDDocumentRepository"
    targetTransactionRef="XDS-ITI-14"
    targetRespondingRoleRef="XSDDocumentRegistry"/>
  <Precedes
    sourceInitiatingRoleRef="XSDDocumentRepository"
    sourceTransactionRef="XDS-ITI-14"
    sourceRespondingRoleRef="XSDDocumentRegistry"
    targetInitiatingRoleRef="XSDDocumentRegistry"
    targetTransactionRef="ATNA-ITI-20"
    targetRespondingRoleRef="ATNAAuditRepository"/>
  <Precedes
    sourceInitiatingRoleRef="XSDDocumentConsumer"
    sourceTransactionRef="ATNA-ITI-19"
    sourceRespondingRoleRef="XSDDocumentRegistry"
    targetInitiatingRoleRef="XSDDocumentConsumer"
    targetTransactionRef="XDS-ITI-16"
    targetRespondingRoleRef="XSDDocumentRegistry"/>
  <Precedes
    sourceInitiatingRoleRef="XSDDocumentConsumer"
    sourceTransactionRef="XDS-ITI-16"
    sourceRespondingRoleRef="XSDDocumentRegistry"
    targetInitiatingRoleRef="XSDDocumentRegistry"
    targetTransactionRef="ATNA-ITI-20"
  </Precedes
</Rule>

```

```

        targetRespondingRoleRef="ATNAAuditRepository"/>
</Rule>
<Rule nameID="Rule4"
sourceActorRef="XSDDocumentConsumer" targetActorRef="ATNAPSecureNode">
  <Precedes
    sourceInitiatingRoleRef="XSDDocumentConsumer"
    sourceTransactionRef="ATNA-ITI-19"
    sourceRespondingRoleRef="XSDDocumentRegistry"
    targetInitiatingRoleRef="XSDDocumentConsumer"
    targetTransactionRef="XDS-ITI-16"
    targetRespondingRoleRef="XSDDocumentRegistry"/>
  <Precedes
    sourceInitiatingRoleRef="XSDDocumentConsumer"
    sourceTransactionRef="ATNA-ITI-19"
    sourceRespondingRoleRef="XSDDocumentRepository"
    targetInitiatingRoleRef="XSDDocumentConsumer"
    targetTransactionRef="XDS-ITI-17"
    targetRespondingRoleRef="XSDDocumentRepository"/>
  <Precedes
    sourceInitiatingRoleRef="XSDDocumentConsumer"
    sourceTransactionRef="XDS-ITI-17"
    sourceRespondingRoleRef="XSDDocumentRepository"
    targetInitiatingRoleRef="XSDDocumentRepository"
    targetTransactionRef="ATNA-ITI-20"
    targetRespondingRoleRef="ATNAAuditRepository"/>
</Rule>
<Rule nameID="Rule5" sourceActorRef="XSDDocumentSource" targetActorRef="PIXPIDConsumer">
  <Precedes
    sourceInitiatingRoleRef="XSDDocumentSource"
    sourceTransactionRef="PIX-ITI-9"
    sourceRespondingRoleRef="PIXManager"
    targetInitiatingRoleRef="XSDDocumentSource"
    targetTransactionRef="XDS-ITI-15"
    targetRespondingRoleRef="XSDDocumentRepository"/>
</Rule>
<Rule nameID="Rule6"
sourceActorRef="XSDDocumentConsumer" targetActorRef="PIXPIDConsumer">
  <Precedes
    sourceInitiatingRoleRef="XSDDocumentConsumer"
    sourceTransactionRef="PIX-ITI-9"
    sourceRespondingRoleRef="PIXManager"
    targetInitiatingRoleRef="XSDDocumentConsumer"
    targetTransactionRef="XDS-ITI-16"
    targetRespondingRoleRef="XSDDocumentRegistry"/>
</Rule>
<Rule nameID="Rule7" sourceActorRef="PIXPIDConsumer" targetActorRef="ATNAPSecureNode">
  <Precedes
    sourceInitiatingRoleRef="PIXPIDConsumer"
    sourceTransactionRef="ATNA-ITI-19"
    sourceRespondingRoleRef="PIXManager"
    targetInitiatingRoleRef="PIXPIDConsumer"
    targetTransactionRef="PIX-ITI-9"
    targetRespondingRoleRef="PIXManager"/>
</Rule>
<Rule nameID="Rule8" sourceActorRef="PIXManager" targetActorRef="ATNAPSecureNode">
  <Precedes
    sourceInitiatingRoleRef="PIXPIDConsumer"
    sourceTransactionRef="ATNA-ITI-19"
    sourceRespondingRoleRef="PIXManager"
    targetInitiatingRoleRef="PIXPIDConsumer"
    targetTransactionRef="PIX-ITI-9"
    targetRespondingRoleRef="PIXManager"/>
  <Precedes
    sourceInitiatingRoleRef="PIXPIDConsumer"
    sourceTransactionRef="PIX-ITI-9"
    sourceRespondingRoleRef="PIXManager"
    targetInitiatingRoleRef="PIXManager"
    targetTransactionRef="ATNA-ITI-20"
    targetRespondingRoleRef="ATNAAuditRepository"/>
</Rule>
<Rule nameID="Rule10"
sourceActorRef="XSDDocumentConsumer" targetActorRef="XServiceUser">
  <Precedes
    sourceInitiatingRoleRef="XSDDocumentConsumer"
    sourceTransactionRef="XDS-ITI-17"
    sourceRespondingRoleRef="XSDDocumentRepository"
    targetInitiatingRoleRef="XSDDocumentRepository"
    targetTransactionRef="XUA-ITI-29-A"
    targetRespondingRoleRef="XSDDocumentConsumer"/>
  <Precedes
    sourceInitiatingRoleRef="XSDDocumentRepository"
    sourceTransactionRef="XUA-ITI-29-A"
    sourceRespondingRoleRef="XSDDocumentConsumer"
    targetInitiatingRoleRef="XSDDocumentConsumer"
    targetTransactionRef="XUA-ITI-29-B"
    targetRespondingRoleRef="XIdentityProvider"/>
  <Precedes
    sourceInitiatingRoleRef="XSDDocumentConsumer"
    sourceTransactionRef="XUA-ITI-29-B"
    sourceRespondingRoleRef="XIdentityProvider"

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```

        targetInitiatingRoleRef="XIdentityProvider"
        targetTransactionRef="XUA-ITI-29-C"
        targetRespondingRoleRef="XDSDocumentConsumer"/>
    <Precedes
        sourceInitiatingRoleRef="XIdentityProvider"
        sourceTransactionRef="XUA-ITI-29-C"
        sourceRespondingRoleRef="XDSDocumentConsumer"
        targetInitiatingRoleRef="XDSDocumentConsumer"
        targetTransactionRef="XUA-ITI-29-D"
        targetRespondingRoleRef="XDSDocumentRepository"/>
    </Rule>
</GroupingRules>
<ProfileRules>
    <Rule nameID="Rule9" profileRef="XDS">
        <Precedes
            sourceInitiatingRoleRef="XDSDocumentSource"
            sourceTransactionRef="XDS-ITI-15"
            sourceRespondingRoleRef="XDSDocumentRepository"
            targetInitiatingRoleRef="XDSDocumentRepository"
            targetTransactionRef="XDS-ITI-14"
            targetRespondingRoleRef="XDSDocumentRegistry"/>
        <Precedes
            sourceInitiatingRoleRef="XDSDocumentConsumer"
            sourceTransactionRef="XDS-ITI-16"
            sourceRespondingRoleRef="XDSDocumentRegistry"
            targetInitiatingRoleRef="XDSDocumentConsumer"
            targetTransactionRef="XDS-ITI-17"
            targetRespondingRoleRef="XDSDocumentRepository"/>
        </Rule>
    </ProfileRules>
</Rules>
</Domain> </EBBPDomainsConfig>

```

APPENDIX C

Sample ebBP Definition for IHE Profiles

```
<?xml version="1.0" encoding="UTF-8"?> <ProcessSpecification
name="IHE IHE-BusinessCollaborations Profile"
nameID="IHE-IHE-BusinessCollaborations-Profile"
uuid="urn:metu-srdc:names:specification:iheIHE-BusinessCollaborationsprofile:schema"
xmlns:xi="http://www.w3.org/2001/XInclude" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
  <xi:include
    href="http://localhost:8080/packages/signals/ebBP-Example-Signals.xml"
    parse="xml" xpointer="element(/1/1)"/>
  <xi:include
    href="http://localhost:8080/packages/businessCollaborations/IHE-
    IndividualBC-IHE-ITI-19-25052006-v1.xml" parse="xml" xpointer="element(/1/2)"/>
  <xi:include
    href="http://localhost:8080/packages/businessCollaborations/IHE-
    IndividualBC-IHE-ITI-15-25052006-v1.xml" parse="xml" xpointer="element(/1/2)"/>
  <xi:include
    href="http://localhost:8080/packages/businessCollaborations/IHE-
    IndividualBC-IHE-ITI-20-25052006-v1.xml" parse="xml" xpointer="element(/1/2)"/>
  <xi:include
    href="http://localhost:8080/packages/businessCollaborations/IHE-
    IndividualBC-IHE-ITI-17-25052006-v1.xml" parse="xml" xpointer="element(/1/2)"/>
  <xi:include
    href="http://localhost:8080/packages/businessCollaborations/IHE-
    IndividualBC-IHE-ITI-16-25052006-v1.xml" parse="xml" xpointer="element(/1/2)"/>
  <xi:include
    href="http://localhost:8080/packages/businessCollaborations/IHE-
    IndividualBC-XDS-IHE-ITI-8-25052006-v1.xml" parse="xml" xpointer="element(/1/2)"/>
  <BusinessCollaboration
    name="Collaboration of ATNA-ITI-19-XDS-ITI-15-ATNA-ITI-20"
    nameID="ATNA-ITI-19-XDS-ITI-15-ATNA-ITI-20"> <Role
      name="XSDSDocumentRegistry XSDSDocumentRepository ATNASecureNode"
      nameID="ATNA-ITI-19-XDS-ITI-15-ATNA-ITI-20XSDSDocumentRegistry-
      XSDSDocumentRepository-ATNASecureNode"/>
    <Role name="XSDSDocumentSource"
      nameID="ATNA-ITI-19-XDS-ITI-15-ATNA-ITI-20XSDSDocumentSource"/>
    <Role name="ATNAAuditRepository"
      nameID="ATNA-ITI-19-XDS-ITI-15-ATNA-ITI-20ATNAAuditRepository"/>
    <TimeToPerform/>
    <Start><ToLink toBusinessStateRef="CA1-ATNA-ITI-19"/></Start>
    <CollaborationActivity collaborationRef="ATNA-IHE-ITI-19"
      name="Node Authentication" nameID="CA1-ATNA-ITI-19">
      <Performs currentRoleRef="ATNA-ITI-19-XDS-ITI-15-ATNA-ITI-20XSDSDocumentSource"
        performsRoleRef="ATNALocalSecureNode"/>
      <Performs currentRoleRef="ATNA-ITI-19-XDS-ITI-15-ATNA-ITI-20XSDSDocumentRegistry-
        XSDSDocumentRepository-ATNASecureNode" performsRoleRef="ATNARemoteSecureNode"/>
    </CollaborationActivity>
    <Transition>
      <FromLink fromBusinessStateRef="CA1-ATNA-ITI-19"/>
      <ToLink toBusinessStateRef="CA2-XDS-ITI-15"/>
    </Transition>
    <CollaborationActivity collaborationRef="XDS-IHE-ITI-15"
      name="Provide and Register Document Set" nameID="CA2-XDS-ITI-15">
      <Performs currentRoleRef="ATNA-ITI-19-XDS-ITI-15-ATNA-ITI-20XSDSDocumentSource"
        performsRoleRef="PRDSXSDSource"/>
      <Performs currentRoleRef="ATNA-ITI-19-XDS-ITI-15-ATNA-ITI-20XSDSDocumentRegistry-
        XSDSDocumentRepository-ATNASecureNode" performsRoleRef="PRDSXDSRepository"/>
    </CollaborationActivity>
```

```

<Transition>
  <FromLink fromBusinessStateRef="CA2-XDS-ITI-15"/>
  <ToLink toBusinessStateRef="CA3-ATNA-ITI-20"/>
</Transition>
<CollaborationActivity collaborationRef="ATNA-IHE-ITI-20"
name="Record Audit Event" nameID="CA3-ATNA-ITI-20">
  <Performs currentRoleRef="ATNA-ITI-19-XDS-ITI-15-ATNA-ITI-20XSDocumentRegistry-
XSDocumentRepository-ATNASecureNode" performsRoleRef="IHEActorORPHIApplication"/>
  <Performs currentRoleRef="ATNA-ITI-19-XDS-ITI-15-ATNA-ITI-20ATNAuditRepository"
performsRoleRef="AuditRecordRepository"/>
</CollaborationActivity>
<Transition>
  <FromLink fromBusinessStateRef="CA3-ATNA-ITI-20"/>
  <ToLink toBusinessStateRef="CA4-ATNA-ITI-19-XDS-ITI-15-ATNA-ITI-20-Success"/>
</Transition>
<Success name="Success" nameID="CA4-ATNA-ITI-19-XDS-ITI-15-ATNA-ITI-20-Success"/>
</BusinessCollaboration>
<BusinessCollaboration
name="Collaboration of ATNA-ITI-19-XDS-ITI-17-ATNA-ITI-20"
nameID="ATNA-ITI-19-XDS-ITI-17-ATNA-ITI-20">
  <Role name="XSDocumentRegistry XSDocumentRepository ATNASecureNode"
nameID="ATNA-ITI-19-XDS-ITI-17-ATNA-ITI-20XSDocumentRegistry-
XSDocumentRepository-ATNASecureNode"/>
  <Role name="ATNAuditRepository" nameID="ATNA-ITI-19-XDS-ITI-17-ATNA-ITI-20ATNAuditRepository"/>
  <Role name="XSDocumentConsumer" nameID="ATNA-ITI-19-XDS-ITI-17-ATNA-ITI-20XSDocumentConsumer"/>
  <TimeToPerform/>
  <Start>
    <ToLink toBusinessStateRef="CA4-ATNA-ITI-19"/>
  </Start>
  <CollaborationActivity collaborationRef="ATNA-IHE-ITI-19"
name="Node Authentication" nameID="CA4-ATNA-ITI-19">
    <Performs currentRoleRef="ATNA-ITI-19-XDS-ITI-17-ATNA-ITI-20XSDocumentConsumer"
performsRoleRef="ATNALocalSecureNode"/>
    <Performs currentRoleRef="ATNA-ITI-19-XDS-ITI-17-ATNA-ITI-20XSDocumentRegistry-
XSDocumentRepository-ATNASecureNode" performsRoleRef="ATNARemoteSecureNode"/>
  </CollaborationActivity>
  <Transition>
    <FromLink fromBusinessStateRef="CA4-ATNA-ITI-19"/>
    <ToLink toBusinessStateRef="CA5-XDS-ITI-17"/>
  </Transition>
  <CollaborationActivity collaborationRef="XDS-IHE-ITI-17"
name="Retrieve Document" nameID="CA5-XDS-ITI-17">
    <Performs currentRoleRef="ATNA-ITI-19-XDS-ITI-17-ATNA-ITI-20XSDocumentConsumer"
performsRoleRef="RDXDSConsumer"/>
    <Performs currentRoleRef="ATNA-ITI-19-XDS-ITI-17-ATNA-ITI-20XSDocumentRegistry-
XSDocumentRepository-ATNASecureNode" performsRoleRef="RDXDSRepository"/>
  </CollaborationActivity>
  <Transition>
    <FromLink fromBusinessStateRef="CA5-XDS-ITI-17"/>
    <ToLink toBusinessStateRef="CA6-ATNA-ITI-20"/>
  </Transition>
  <CollaborationActivity collaborationRef="ATNA-IHE-ITI-20"
name="Record Audit Event" nameID="CA6-ATNA-ITI-20">
    <Performs currentRoleRef="ATNA-ITI-19-XDS-ITI-17-ATNA-ITI-20XSDocumentRegistry-
XSDocumentRepository-ATNASecureNode" performsRoleRef="IHEActorORPHIApplication"/>
    <Performs currentRoleRef="ATNA-ITI-19-XDS-ITI-17-ATNA-ITI-20ATNAuditRepository"
performsRoleRef="AuditRecordRepository"/>
  </CollaborationActivity>
  <Transition>
    <FromLink fromBusinessStateRef="CA6-ATNA-ITI-20"/>
    <ToLink toBusinessStateRef="CA7-ATNA-ITI-19-XDS-ITI-17-ATNA-ITI-20-Success"/>
  </Transition>
  <Success name="Success" nameID="CA7-ATNA-ITI-19-XDS-ITI-17-ATNA-ITI-20-Success"/>
</BusinessCollaboration>
<BusinessCollaboration
name="Collaboration of ATNA-ITI-19-XDS-ITI-16-ATNA-ITI-20-ATNA-ITI-19-XDS-ITI-17-ATNA-ITI-20"
nameID="ATNA-ITI-19-XDS-ITI-16-ATNA-ITI-20-ATNA-ITI-19-XDS-ITI-17-ATNA-ITI-20">
  <Role name="XSDocumentRegistry XSDocumentRepository ATNASecureNode"
nameID="ATNA-ITI-19-XDS-ITI-16-ATNA-ITI-20-ATNA-ITI-19-XDS-ITI-17-ATNA-ITI-
20XSDocumentRegistry-XSDocumentRepository-ATNASecureNode"/>
  <Role name="ATNAuditRepository" nameID="ATNA-ITI-19-XDS-ITI-16-ATNA-ITI-20-
ATNA-ITI-19-XDS-ITI-17-ATNA-ITI-20ATNAuditRepository"/>
  <Role name="XSDocumentConsumer" nameID="ATNA-ITI-19-XDS-ITI-16-ATNA-ITI-20-
ATNA-ITI-19-XDS-ITI-17-ATNA-ITI-20XSDocumentConsumer"/>
  <TimeToPerform/>
  <Start>
    <ToLink toBusinessStateRef="CA7-ATNA-ITI-19"/>
  </Start>
  <CollaborationActivity collaborationRef="ATNA-IHE-ITI-19"
name="Node Authentication" nameID="CA7-ATNA-ITI-19">
    <Performs currentRoleRef="ATNA-ITI-19-XDS-ITI-16-ATNA-ITI-20-ATNA-ITI-19-XDS-ITI-17-
ATNA-ITI-20XSDocumentConsumer" performsRoleRef="ATNALocalSecureNode"/>
    <Performs currentRoleRef="ATNA-ITI-19-XDS-ITI-16-ATNA-ITI-20-ATNA-ITI-19-XDS-ITI-17-
ATNA-ITI-20XSDocumentRegistry-XSDocumentRepository-ATNASecureNode"
performsRoleRef="ATNARemoteSecureNode"/>
  </CollaborationActivity>
  <Transition>
    <FromLink fromBusinessStateRef="CA7-ATNA-ITI-19"/>
    <ToLink toBusinessStateRef="CA8-XDS-ITI-16"/>
  </Transition>

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<CollaborationActivity collaborationRef="XDS-IHE-ITI-16"
  name="Query Registry" nameID="CA8-XDS-ITI-16">
  <Performs currentRoleRef="ATNA-ITI-19-XDS-ITI-16-ATNA-ITI-20-ATNA-ITI-19-XDS-ITI-17-
  ITI-20XSDocumentConsumer" performsRoleRef="QRXDSConsumer"/>
  <Performs currentRoleRef="ATNA-ITI-19-XDS-ITI-16-ATNA-ITI-20-ATNA-ITI-19-XDS-ITI-17-
  ATNA-ITI-20XSDocumentRegistry-XSDocumentRepository-ATNASecureNode"
  performsRoleRef="QRXDSRegistry"/>
</CollaborationActivity>
<Transition>
  <FromLink fromBusinessStateRef="CA8-XDS-ITI-16"/>
  <ToLink toBusinessStateRef="CA9-ATNA-ITI-20"/>
</Transition>
<CollaborationActivity collaborationRef="ATNA-IHE-ITI-20"
  name="Record Audit Event" nameID="CA9-ATNA-ITI-20">
  <Performs currentRoleRef="ATNA-ITI-19-XDS-ITI-16-ATNA-ITI-20-ATNA-ITI-19-XDS-ITI-17-
  ATNA-ITI-20XSDocumentRegistry-XSDocumentRepository-ATNASecureNode"
  performsRoleRef="IHEActorORPHIApplication"/>
  <Performs currentRoleRef="ATNA-ITI-19-XDS-ITI-16-ATNA-ITI-20-ATNA-ITI-19-XDS-ITI-17-
  ATNA-ITI-20ATNAAuditRepository" performsRoleRef="AuditRecordRepository"/>
</CollaborationActivity>
<Transition>
  <FromLink fromBusinessStateRef="CA9-ATNA-ITI-20"/>
  <ToLink toBusinessStateRef="CA10-ATNA-ITI-19"/>
</Transition>
<CollaborationActivity collaborationRef="ATNA-IHE-ITI-19"
  name="Node Authentication" nameID="CA10-ATNA-ITI-19">
  <Performs currentRoleRef="ATNA-ITI-19-XDS-ITI-16-ATNA-ITI-20-ATNA-ITI-19-XDS-ITI-17-
  ATNA-ITI-20XSDocumentConsumer" performsRoleRef="ATNALocalSecureNode"/>
  <Performs currentRoleRef="ATNA-ITI-19-XDS-ITI-16-ATNA-ITI-20-ATNA-ITI-19-XDS-ITI-17-
  ATNA-ITI-20XSDocumentRegistry-XSDocumentRepository-ATNASecureNode"
  performsRoleRef="ATNARemoteSecureNode"/>
</CollaborationActivity>
<Transition>
  <FromLink fromBusinessStateRef="CA10-ATNA-ITI-19"/>
  <ToLink toBusinessStateRef="CA11-XDS-ITI-17"/>
</Transition>
<CollaborationActivity collaborationRef="XDS-IHE-ITI-17"
  name="Retrieve Document" nameID="CA11-XDS-ITI-17">
  <Performs currentRoleRef="ATNA-ITI-19-XDS-ITI-16-ATNA-ITI-20-ATNA-ITI-19-XDS-ITI-17-
  ATNA-ITI-20XSDocumentConsumer" performsRoleRef="RDXDSConsumer"/>
  <Performs currentRoleRef="ATNA-ITI-19-XDS-ITI-16-ATNA-ITI-20-ATNA-ITI-19-XDS-ITI-17-
  ATNA-ITI-20XSDocumentRegistry-XSDocumentRepository-ATNASecureNode"
  performsRoleRef="RDXDSRepository"/>
</CollaborationActivity>
<Transition>
  <FromLink fromBusinessStateRef="CA11-XDS-ITI-17"/>
  <ToLink toBusinessStateRef="CA12-ATNA-ITI-20"/>
</Transition>
<CollaborationActivity collaborationRef="ATNA-IHE-ITI-20"
  name="Record Audit Event" nameID="CA12-ATNA-ITI-20">
  <Performs currentRoleRef="ATNA-ITI-19-XDS-ITI-16-ATNA-ITI-20-ATNA-ITI-19-XDS-ITI-17-
  ATNA-ITI-20XSDocumentRegistry-XSDocumentRepository-ATNASecureNode"
  performsRoleRef="IHEActorORPHIApplication"/>
  <Performs currentRoleRef="ATNA-ITI-19-XDS-ITI-16-ATNA-ITI-20-ATNA-ITI-19-XDS-ITI-17-
  ATNA-ITI-20ATNAAuditRepository" performsRoleRef="AuditRecordRepository"/>
</CollaborationActivity>
<Transition>
  <FromLink fromBusinessStateRef="CA12-ATNA-ITI-20"/>
  <ToLink toBusinessStateRef="CA13-ATNA-ITI-19-XDS-ITI-16-ATNA-ITI-20-
  ATNA-ITI-19-XDS-ITI-17-ATNA-ITI-20-Success"/>
</Transition>
<Success name="Success" nameID="CA13-ATNA-ITI-19-XDS-ITI-16-ATNA-ITI-20-
  ATNA-ITI-19-XDS-ITI-17-ATNA-ITI-20-Success"/>
</BusinessCollaboration>
<BusinessCollaboration name="Collaboration of XDS-ITI-8" nameID="XDS-ITI-8">
  <Role name="XDSPIDSource" nameID="XDS-ITI-8XDSPIDSource"/>
  <Role
    name="XSDocumentRegistry XSDocumentRepository ATNASecureNode"
    nameID="XDS-ITI-8XSDocumentRegistry-XSDocumentRepository-ATNASecureNode"/>
  <TimeToPerform/>
  <Start>
    <ToLink toBusinessStateRef="CA13-XDS-ITI-8"/>
  </Start>
  <CollaborationActivity collaborationRef="XDS-IHE-ITI-8"
    name="Patient Identity Feed" nameID="CA13-XDS-ITI-8">
    <Performs currentRoleRef="XDS-ITI-8XDSPIDSource" performsRoleRef="PIDSource"/>
    <Performs currentRoleRef="XDS-ITI-8XSDocumentRegistry-XSDocumentRepository-
    ATNASecureNode" performsRoleRef="XDSRegistry"/>
  </CollaborationActivity>
  <Transition>
    <FromLink fromBusinessStateRef="CA13-XDS-ITI-8"/>
    <ToLink toBusinessStateRef="CA14-XDS-ITI-8-Success"/>
  </Transition>
  <Success name="Success" nameID="CA14-XDS-ITI-8-Success"/>
</BusinessCollaboration>
<BusinessCollaboration
  name="Collaboration of ATNA-ITI-19-XDS-ITI-16-ATNA-ITI-20"
  nameID="ATNA-ITI-19-XDS-ITI-16-ATNA-ITI-20">
  <Role name="XSDocumentRegistry XSDocumentRepository ATNASecureNode"
  nameID="ATNA-ITI-19-XDS-ITI-16-ATNA-ITI-20XSDocumentRegistry-

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```

XDSDocumentRepository-ATNASecureNode"/>
<Role name="ATNAAuditRepository" nameID="ATNA-ITI-19-XDS-ITI-16-ATNA-ITI-
20ATNAAuditRepository"/>
<Role name="XSDocumentConsumer" nameID="ATNA-ITI-19-XDS-ITI-16-ATNA-ITI-
20XSDocumentConsumer"/>
<TimeToPerform/>
<Start> <ToLink toBusinessStateRef="CA14-ATNA-ITI-19"/> </Start>
<CollaborationActivity collaborationRef="ATNA-IHE-ITI-19"
name="Node Authentication" nameID="CA14-ATNA-ITI-19">
<Performs currentRoleRef="ATNA-ITI-19-XDS-ITI-16-ATNA-ITI-20XSDocumentConsumer"
performsRoleRef="ATNALocalSecureNode"/>
<Performs currentRoleRef="ATNA-ITI-19-XDS-ITI-16-ATNA-ITI-20XSDocumentRegistry-
XSDocumentRepository-ATNASecureNode" performsRoleRef="ATNARemoteSecureNode"/>
</CollaborationActivity>
<Transition>
<FromLink fromBusinessStateRef="CA14-ATNA-ITI-19"/>
<ToLink toBusinessStateRef="CA15-XDS-ITI-16"/>
</Transition>
<CollaborationActivity collaborationRef="XDS-IHE-ITI-16"
name="Query Registry" nameID="CA15-XDS-ITI-16">
<Performs currentRoleRef="ATNA-ITI-19-XDS-ITI-16-ATNA-ITI-20XSDocumentConsumer"
performsRoleRef="QRXDSConsumer"/>
<Performs currentRoleRef="ATNA-ITI-19-XDS-ITI-16-ATNA-ITI-20XSDocumentRegistry-
XSDocumentRepository-ATNASecureNode" performsRoleRef="QRXDSRegistry"/>
</CollaborationActivity>
<Transition>
<FromLink fromBusinessStateRef="CA15-XDS-ITI-16"/>
<ToLink toBusinessStateRef="CA16-ATNA-ITI-20"/>
</Transition>
<CollaborationActivity collaborationRef="ATNA-IHE-ITI-20"
name="Record Audit Event" nameID="CA16-ATNA-ITI-20">
<Performs currentRoleRef="ATNA-ITI-19-XDS-ITI-16-ATNA-ITI-20XSDocumentRegistry-
XSDocumentRepository-ATNASecureNode" performsRoleRef="IHEActorORPHIApplication"/>
<Performs currentRoleRef="ATNA-ITI-19-XDS-ITI-16-ATNA-ITI-20ATNAAuditRepository"
performsRoleRef="AuditRecordRepository"/>
</CollaborationActivity>
<Transition>
<FromLink fromBusinessStateRef="CA16-ATNA-ITI-20"/>
<ToLink toBusinessStateRef="CA17-ATNA-ITI-19-XDS-ITI-16-ATNA-ITI-20-Success"/>
</Transition>
<Success name="Success" nameID="CA17-ATNA-ITI-19-XDS-ITI-16-ATNA-ITI-20-Success"/>
</BusinessCollaboration>
</ProcessSpecification>

```

APPENDIX D

Sample CPP Document Created by IHE-CMT(Shortened Version)

```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<ns1:CollaborationProtocolProfile
ns1:cupid="d575e3aa-5920-11db-8725-8762c22752d6"
ns1:version="2_0b"
xmlns:ns1="http://www.oasis-open.org/committees/ebxml-cppa/schema/cpp-cpa-2_0.xsd">
  <ns1:PartyInfo ns1:defaultMshChannelId="SyncChannel1"
ns1:defaultMshPackageId="MshSignalPackage" ns1:partyName="metu">
    <ns1:PartyId ns1:type="urn:oasis:names:tc:ebxml-cppa:partyid-type:duns">
      8689b9f5-5920-11db-8725-8762c22752d6</ns1:PartyId>
    <ns1:PartyRef ns2:href="http://www.srdc.metu.edu.tr" ns2:type="simple"
xmlns:ns2="http://www.w3.org/1999/xlink"/>
    <ns1:PartyRef ns3:href="http:www.jkk" ns3:type="simple"
xmlns:ns3="http://www.w3.org/1999/xlink"/>
  <ns1:CollaborationRole>
    <ns1:ProcessSpecification ns4:href="http://localhost:8080/vcp/ebbp/
XDSDocumentRegistry-XDSDocumentRepository-ATNASecureNode.xml"
ns4:type="simple" ns1:name="IHE IHE-BusinessCollaborations Profile"
ns1:uuid="urn:metu-srdc:names:specification:iheIHE-BusinessCollaborationsprofile:schema"
ns1:version="Unknown" xmlns:ns4="http://www.w3.org/1999/xlink"/>
    <ns1:Role ns5:href="http://localhost:8080/vcp/ebbp/XDSDocumentRegistry-XDSDocumentRepository-
ATNASecureNode.xml#XDSDocumentSource" ns5:type="simple" ns1:name="XDSDocumentSource"
xmlns:ns5="http://www.w3.org/1999/xlink"/>
    <ns1:ServiceBinding>
      <ns1:Service>urn:metu-srdc:names:specification:iheIHE-BusinessCollaborationsprofile:schema
    </ns1:Service>
    <ns1:CanSend>
      <ns1:ThisPartyActionBinding ns1:action="IHE XDS Provide/Register Document Set BTA Action"
ns1:id="a9a5c376-5920-11db-8725-8762c22752d6" ns1:packageId="RequestPackage"
ns6:type="simple" xmlns:ns6="http://www.w3.org/1999/xlink">
        <ns1:BusinessTransactionCharacteristics ns1:isAuthenticated="persistent"
ns1:isAuthorizationRequired="true" ns1:isConfidential="persistent"
ns1:isIntelligibleCheckRequired="false" ns1:isNonRepudiationReceiptRequired="true"
ns1:isNonRepudiationRequired="true" ns1:isTamperProof="none"/>
        <ns1:ActionContext ns1:binaryCollaboration="IHE XDS Provide/Register Document Set"
ns1:businessTransactionActivity="IHE XDS Provide/Register Document Set BTA"
ns1:requestOrResponseAction="Provide/Register Document Set Requesting Business Activity"/>
      <ns1:ChannelId>SyncChannel1</ns1:ChannelId>
    </ns1:ThisPartyActionBinding>
    <ns1:CanReceive>
      <ns1:ThisPartyActionBinding ns1:action="IHE XDS Provide/Register Document Set BTA Action"
ns1:id="a9aa5757-5920-11db-8725-8762c22752d6" ns1:packageId="RequestPackage"
ns7:type="simple" xmlns:ns7="http://www.w3.org/1999/xlink">
        <ns1:BusinessTransactionCharacteristics ns1:isAuthenticated="persistent"
ns1:isAuthorizationRequired="true" ns1:isConfidential="persistent"
ns1:isIntelligibleCheckRequired="false" ns1:isNonRepudiationReceiptRequired="true"
ns1:isNonRepudiationRequired="true" ns1:isTamperProof="none"/>
        <ns1:ActionContext ns1:binaryCollaboration="IHE XDS Provide/Register Document Set"
ns1:businessTransactionActivity="IHE XDS Provide/Register Document Set BTA"
ns1:requestOrResponseAction="Provide/Register Document Set Responding Business Activity"/>
    </ns1:CanReceive>
  </ns1:CollaborationRole>
</ns1:PartyInfo>
</ns1:CollaborationProtocolProfile>
```



```

        <ns1:ChannelId>SyncChannel1</ns1:ChannelId>
    </ns1:ThisPartyActionBinding>
</ns1:CanReceive>
<ns1:CanReceive>
    <ns1:ThisPartyActionBinding ns1:action="IHE XDS Provide/Register Document Set BTA Action"
    ns1:id="a9b37f18-5920-11db-8725-8762c22752d6" ns1:packageId="ReceiptAckPackage"
    ns8:type="simple" xmlns:ns8="http://www.w3.org/1999/xlink">
        <ns1:BusinessTransactionCharacteristics ns1:isAuthenticated="persistent"
        ns1:isAuthorizationRequired="true" ns1:isConfidential="persistent"
        ns1:isIntelligibleCheckRequired="false" ns1:isNonRepudiationReceiptRequired="true"
        ns1:isNonRepudiationRequired="true" ns1:isTamperProof="none"/>
        <ns1:ActionContext ns1:binaryCollaboration="IHE XDS Provide/Register Document Set"
        ns1:businessTransactionActivity="IHE XDS Provide/Register Document Set BTA"
        ns1:requestOrResponseAction="Provide/Register Document Set Responding Business Activity"/>
    <ns1:ChannelId>SyncChannel1</ns1:ChannelId>
    </ns1:ThisPartyActionBinding>
</ns1:CanReceive>
<ns1:CanReceive>
    <ns1:ThisPartyActionBinding ns1:action="IHE XDS Provide/Register Document Set BTA Action"
    ns1:id="a9c2e869-5920-11db-8725-8762c22752d6" ns1:packageId="ReceiptAckExceptionPackage"
    ns9:type="simple" xmlns:ns9="http://www.w3.org/1999/xlink">
        <ns1:BusinessTransactionCharacteristics ns1:isAuthenticated="persistent"
        ns1:isAuthorizationRequired="true" ns1:isConfidential="persistent"
        ns1:isIntelligibleCheckRequired="false" ns1:isNonRepudiationReceiptRequired="true"
        ns1:isNonRepudiationRequired="true" ns1:isTamperProof="none"/>
        <ns1:ActionContext ns1:binaryCollaboration="IHE XDS Provide/Register Document Set"
        ns1:businessTransactionActivity="IHE XDS Provide/Register Document Set BTA"
        ns1:requestOrResponseAction="Provide/Register Document Set Responding Business Activity"/>
    <ns1:ChannelId>SyncChannel1</ns1:ChannelId>
    </ns1:ThisPartyActionBinding>
</ns1:CanReceive>
<ns1:CanReceive>
    <ns1:ThisPartyActionBinding ns1:action="IHE XDS Provide/Register Document Set BTA Action"
    ns1:id="a9cc102a-5920-11db-8725-8762c22752d6" ns1:packageId="AcceptanceAckPackage"
    ns10:type="simple" xmlns:ns10="http://www.w3.org/1999/xlink">
        <ns1:BusinessTransactionCharacteristics ns1:isAuthenticated="persistent"
        ns1:isAuthorizationRequired="true" ns1:isConfidential="persistent"
        ns1:isIntelligibleCheckRequired="false" ns1:isNonRepudiationReceiptRequired="true"
        ns1:isNonRepudiationRequired="true" ns1:isTamperProof="none"/>
        <ns1:ActionContext ns1:binaryCollaboration="IHE XDS Provide/Register Document Set"
        ns1:businessTransactionActivity="IHE XDS Provide/Register Document Set BTA"
        ns1:requestOrResponseAction="Provide/Register Document Set Responding Business Activity"/>
    <ns1:ChannelId>SyncChannel1</ns1:ChannelId>
    </ns1:ThisPartyActionBinding>
</ns1:CanReceive>
</ns1:CanSend>
</ns1:ServiceBinding>
</ns1:CollaborationRole>
<ns1:DeliveryChannel ns1:channelId="SyncChannel1"
ns1:docExchangeId="DocExchange1" ns1:transportId="Transport1">
    <ns1:MessagingCharacteristics ns1:ackRequested="perMessage"
    ns1:ackSignatureRequested="always" ns1:duplicateElimination="always"
    ns1:syncReplyMode="signalsAndResponse"/>
</ns1:DeliveryChannel>
<ns1:Transport ns1:transportId="Transport1">
    <ns1:TransportSender>
        <ns1:TransportProtocol ns1:version="1.1">HTTP</ns1:TransportProtocol>
    </ns1:TransportSender>
    <ns1:TransportReceiver>
        <ns1:TransportProtocol ns1:version="1.1">HTTP</ns1:TransportProtocol>
        <ns1:Endpoint ns1:uri="http:127.0.0.0:"/>
    </ns1:TransportReceiver>
</ns1:Transport>
<ns1:DocExchange ns1:docExchangeId="DocExchange1">
    <ns1:ebXMLSenderBinding ns1:version="2.0"/>
    <ns1:ebXMLReceiverBinding ns1:version="2.0"/>
</ns1:DocExchange>
</ns1:PartyInfo>
<ns1:SimplePart ns1:id="MsgHdr" ns1:mimetype="text/xml">
    <ns1:NamespaceSupported ns1:location="http://www.oasis-open.org/committees/
    ebxml-msg/schema/msg-header-2_0.xsd"
    ns1:version="2.0">http://www.oasis-open.org/committees/ebxml-msg/schema/
    msg-header-2_0.xsd</ns1:NamespaceSupported>
</ns1:SimplePart>
<ns1:Packaging ns1:id="MshSignalPackage">
    <ns1:ProcessingCapabilities ns1:generate="true" ns1:parse="true"/>
    <ns1:CompositeList>
        <ns1:Composite ns1:id="MshSignal" ns1:mimeparameters="type=text/xml"
        ns1:mimetype="multipart/related">
            <ns1:Constituent ns1:idref="MsgHdr"/>
        </ns1:Composite>
    </ns1:CompositeList>
</ns1:Packaging>

```

```

        </ns1:CompositeList>
    </ns1:Packaging>
    <ns1:Packaging ns1:id="RequestPackage">
        <ns1:ProcessingCapabilities ns1:generate="true" ns1:parse="true"/>
        <ns1:CompositeList>
            <ns1:Composite ns1:id="RequestMsg" ns1:mimeparameters="type=text/xml"
                ns1:mimetype="multipart/related">
                <ns1:Constituent ns1:idref="MsgHdr"/>
                <ns1:Constituent ns1:idref="Request"/>
            </ns1:Composite>
        </ns1:CompositeList>
    </ns1:Packaging>
    <ns1:Packaging ns1:id="ResponsePackage">
        <ns1:ProcessingCapabilities ns1:generate="true" ns1:parse="true"/>
        <ns1:CompositeList>
            <ns1:Composite ns1:id="ResponseMsg" ns1:mimeparameters="type=text/xml"
                ns1:mimetype="multipart/related">
                <ns1:Constituent ns1:excludedFromSignature="false" ns1:idref="MsgHdr"/>
                <ns1:Constituent ns1:excludedFromSignature="false" ns1:idref="Response"/>
            </ns1:Composite>
        </ns1:CompositeList>
    </ns1:Packaging>
    <ns1:Packaging ns1:id="ReceiptAckResponsePackage">
        <ns1:ProcessingCapabilities ns1:generate="true" ns1:parse="true"/>
        <ns1:CompositeList>
            <ns1:Composite ns1:id="SignalAndResponseMsg" ns1:mimeparameters="type=text/xml"
                ns1:mimetype="multipart/related">
                <ns1:Constituent ns1:idref="MsgHdr"/>
                <ns1:Constituent ns1:idref="ReceiptAcknowledgment"/>
                <ns1:Constituent ns1:idref="Response"/>
            </ns1:Composite>
        </ns1:CompositeList>
    </ns1:Packaging>
    <ns1:Packaging ns1:id="ReceiptAckPackage">
        <ns1:ProcessingCapabilities ns1:generate="true" ns1:parse="true"/>
        <ns1:CompositeList>
            <ns1:Composite ns1:id="ReceiptAckMsg" ns1:mimeparameters="type=text/xml"
                ns1:mimetype="multipart/related">
                <ns1:Constituent ns1:idref="MsgHdr"/>
                <ns1:Constituent ns1:idref="ReceiptAcknowledgment"/>
            </ns1:Composite>
        </ns1:CompositeList>
    </ns1:Packaging>
    <ns1:Packaging ns1:id="ReceiptAckExceptionPackage">
        <ns1:ProcessingCapabilities ns1:generate="true" ns1:parse="true"/>
        <ns1:CompositeList>
            <ns1:Composite ns1:id="ReceiptAckExceptionMsg" ns1:mimeparameters="type=text/xml"
                ns1:mimetype="multipart/related">
                <ns1:Constituent ns1:idref="MsgHdr"/>
                <ns1:Constituent ns1:idref="ReceiptAcknowledgmentException"/>
            </ns1:Composite>
        </ns1:CompositeList>
    </ns1:Packaging>
    <ns1:Packaging ns1:id="AcceptanceAckPackage">
        <ns1:ProcessingCapabilities ns1:generate="true" ns1:parse="true"/>
        <ns1:CompositeList>
            <ns1:Composite ns1:id="AcceptanceAckMsg" ns1:mimeparameters="multipart/related"
                ns1:mimetype="multipart/related">
                <ns1:Constituent ns1:excludedFromSignature="false"
                    ns1:idref="MsgHdr"/>
                <ns1:Constituent ns1:excludedFromSignature="false"
                    ns1:idref="AcceptanceAcknowledgment"/>
            </ns1:Composite>
        </ns1:CompositeList>
    </ns1:Packaging>
</ns1:CollaborationProtocolProfile>

```

APPENDIX E

Sample CPA Document Created by IHE-CMT(Shortened Version)

```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<ns1:CollaborationProtocolAgreement
ns1:cpaid="0ba69c70-5465-11db-9d8d-0f09e721e86f"
ns1:version="2_0b"
xmlns:ns1="http://www.oasis-open.org/committees/ebxml-cppa/schema/cpp-cpa-2_0.xsd">
  <ns1:Status ns1:value="agreed"/>
  <ns1:Start>2006-10-05T00:00:00+03:00</ns1:Start>
  <ns1:End>2011-10-05T00:00:00+03:00</ns1:End>
  <ns1:ConversationConstraints ns1:concurrentConversations="10"
ns1:invocationLimit="10000"/>
  <ns1:PartyInfo ns1:defaultMshChannelId="SyncChannel1" ns1:defaultMshPackageId="MshSignalPackage"
ns1:partyName="dasdasd">
    <ns1:PartyId ns1:type="urn:oasis:names:tc:ebxml-cppa:partyid-type:duns">
e2c47c82-5461-11db-8b92-ebe93e8fa0c3</ns1:PartyId>
    <ns1:PartyRef ns2:href="http://www.srdc.metu.edu.tr" ns2:type="simple"
xmlns:ns2="http://www.w3.org/1999/xlink"/>
    <ns1:PartyRef ns3:href="asdas" ns3:type="simple" xmlns:ns3="http://www.w3.org/1999/xlink"/>
    <ns1:CollaborationRole>
      <ns1:ProcessSpecification ns4:href="http://localhost:8080/vcp/ebbp/
XSDDocumentRegistry-XSDDocumentRepository-ATNASecureNode.xml"
ns4:type="simple" ns1:name="IHE IHE-BusinessCollaborations Profile"
ns1:uuid="urn:metu-srdc:names:specification:iheIHE-BusinessCollaborationsprofile:schema"
ns1:version="Unknown" xmlns:ns4="http://www.w3.org/1999/xlink"/>
      <ns1:Role ns5:href="http://localhost:8080/vcp/ebbp/XSDDocumentRegistry-
XSDDocumentRepository-ATNASecureNode.xml#XSDDocumentRegistry XSDDocumentRepository ATNASecureNode"
ns5:type="simple" ns1:name="XSDDocumentRegistry XSDDocumentRepository ATNASecureNode"
xmlns:ns5="http://www.w3.org/1999/xlink"/>
      <ns1:ServiceBinding>
      <ns1:Service>urn:metu-srdc:names:specification:iheIHE-BusinessCollaborationsprofile:schema
      </ns1:Service>
    </ns1:CollaborationRole>
  </ns1:PartyInfo>
  ...
  <ns1:CanSend>
    <ns1:ThisPartyActionBinding ns1:action="Node Authentication BTA Action"
ns1:id="f357f3fb-5461-11db-8b92-ebe93e8fa0c3" ns1:packageId="RequestPackage"
ns26:type="simple" xmlns:ns26="http://www.w3.org/1999/xlink">
      <ns1:BusinessTransactionCharacteristics ns1:isAuthenticated="persistent"
ns1:isAuthorizationRequired="true" ns1:isConfidential="persistent"
ns1:isIntelligibleCheckRequired="false"
ns1:isNonRepudiationReceiptRequired="true"
ns1:isNonRepudiationRequired="true" ns1:isTamperProof="none"/>
      <ns1:ActionContext ns1:binaryCollaboration="Node Authentication"
ns1:businessTransactionActivity="Node Authentication BTA"
ns1:requestOrResponseAction="Node Authentication Requesting Business Activity"/>
      <ns1:ChannelId>SyncChannel1</ns1:ChannelId>
    </ns1:ThisPartyActionBinding>
  </ns1:CanSend>
  ...
  <ns1:CanReceive>
    <ns1:ThisPartyActionBinding ns1:action="Patient Identity Feed BTA Action"
```

```

ns1:id="e9a7f1d3-5461-11db-8b92-ebe93e8fa0c3" ns1:packageId="RequestPackage"
ns54:type="simple" xmlns:ns54="http://www.w3.org/1999/xlink">
  <ns1:BusinessTransactionCharacteristics ns1:isAuthenticated="persistent"
ns1:isAuthorizationRequired="true" ns1:isConfidential="persistent"
ns1:isIntelligibleCheckRequired="false" ns1:isNonRepudiationReceiptRequired="true"
ns1:isNonRepudiationRequired="true" ns1:isTamperProof="none"/>
  <ns1:ActionContext ns1:binaryCollaboration="XDS Patient Identity Feed"
ns1:businessTransactionActivity="Patient Identity Feed BTA"
ns1:requestOrResponseAction="Patient Identity Feed Responding Business Activity"/>
  <ns1:ChannelId>SyncChannel1</ns1:ChannelId>
</ns1:ThisPartyActionBinding>
<ns1:CanSend>
  <ns1:ThisPartyActionBinding ns1:action="Patient Identity Feed BTA Action"
ns1:id="e9af92f4-5461-11db-8b92-ebe93e8fa0c3" ns1:packageId="ReceiptAckPackage"
ns55:type="simple" xmlns:ns55="http://www.w3.org/1999/xlink">
  <ns1:BusinessTransactionCharacteristics ns1:isAuthenticated="persistent"
ns1:isAuthorizationRequired="true" ns1:isConfidential="persistent"
ns1:isIntelligibleCheckRequired="false" ns1:isNonRepudiationReceiptRequired="true"
ns1:isNonRepudiationRequired="true" ns1:isTamperProof="none"/>
  <ns1:ActionContext ns1:binaryCollaboration="XDS Patient Identity Feed"
ns1:businessTransactionActivity="Patient Identity Feed BTA"
ns1:requestOrResponseAction="Patient Identity Feed Requesting Business Activity"/>
  <ns1:ChannelId>SyncChannel1</ns1:ChannelId>
</ns1:ThisPartyActionBinding>
</ns1:CanSend>
...
</ns1:CanReceive>
...
</ns1:ServiceBinding>
</ns1:CollaborationRole>
<ns1:DeliveryChannel ns1:channelId="SyncChannel1" ns1:docExchangeId="DocExchange1"
ns1:transportId="Transport1">
  <ns1:MessagingCharacteristics ns1:ackRequested="perMessage"
ns1:ackSignatureRequested="always" ns1:duplicateElimination="always"
ns1:syncReplyMode="signalsAndResponse"/>
</ns1:DeliveryChannel>
<ns1:Transport ns1:transportId="Transport1">
  <ns1:TransportSender>
    <ns1:TransportProtocol ns1:version="1.1">HTTP</ns1:TransportProtocol>
  </ns1:TransportSender>
  <ns1:TransportReceiver>
    <ns1:TransportProtocol ns1:version="1.1">HTTP</ns1:TransportProtocol>
    <ns1:Endpoint ns1:uri="http://127.0.0.1:5555"/>
  </ns1:TransportReceiver>
</ns1:Transport>
<ns1:DocExchange ns1:docExchangeId="DocExchange1">
  <ns1:ebXMLSenderBinding ns1:version="2.0"/>
  <ns1:ebXMLReceiverBinding ns1:version="2.0"/>
</ns1:DocExchange>
</ns1:PartyInfo>
<ns1:PartyInfo ns1:defaultMshChannelId="SyncChannel13" ns1:defaultMshPackageId="MshSignalPackage11"
ns1:partyName="dfgdf">
  <ns1:PartyId ns1:type="urn:oasis:names:tc:ebxml-cppa:partyid-type:duns">
36df1874-5462-11db-a1a9-1b2af84110c9</ns1:PartyId>
  <ns1:PartyRef ns122:href="http://www.srdc.metu.edu.tr" ns122:type="simple"
xmlns:ns122="http://www.w3.org/1999/xlink"/>
  <ns1:PartyRef ns123:href="gdfgdf" ns123:type="simple"
xmlns:ns123="http://www.w3.org/1999/xlink"/>
  <ns1:CollaborationRole>
    <ns1:ProcessSpecification ns124:href="http://localhost:8080/vcp/ebbp/
XDSDocumentRegistry-XDSDocumentRepository-ATNAAuditRepository.xml" ns124:type="simple"
ns1:name="IHE IHE-BusinessCollaborations Profile"
ns1:uuid="urn:metu-srdc:names:specification:iheIHE-BusinessCollaborationsprofile:schema"
ns1:version="Unknown" xmlns:ns124="http://www.w3.org/1999/xlink"/>
    <ns1:Role ns125:href="http://localhost:8080/vcp/ebbp/XDSDocumentRegistry-
XDSDocumentRepository-ATNAAuditRepository.xml#ATNAAuditRepository" ns125:type="simple"
ns1:name="ATNAAuditRepository" xmlns:ns125="http://www.w3.org/1999/xlink"/>
  </ns1:ServiceBinding>
  <ns1:Service>urn:metu-srdc:names:specification:iheIHE-BusinessCollaborationsprofile:schema
</ns1:Service>
  <ns1:CanReceive>
    <ns1:ThisPartyActionBinding ns1:action="Record Audit Event BTA Action"
ns1:id="3d3a7205-5462-11db-a1a9-1b2af84110c9" ns1:packageId="RequestPackage12"
ns126:type="simple" xmlns:ns126="http://www.w3.org/1999/xlink">
      <ns1:BusinessTransactionCharacteristics ns1:isAuthenticated="persistent"
ns1:isAuthorizationRequired="true" ns1:isConfidential="persistent"
ns1:isIntelligibleCheckRequired="false" ns1:isNonRepudiationReceiptRequired="true"
ns1:isNonRepudiationRequired="true" ns1:isTamperProof="none"/>
      <ns1:ActionContext ns1:binaryCollaboration="Record Audit Event"
ns1:businessTransactionActivity="Record Audit Event BTA"
ns1:requestOrResponseAction="Record Audit Event Responding Business Activity"/>
      <ns1:ChannelId>SyncChannel13</ns1:ChannelId>
    </ns1:ThisPartyActionBinding>
  </ns1:CanSend>
  <ns1:ThisPartyActionBinding ns1:action="Record Audit Event BTA Action"

```

```

ns1:id="3d3f05e6-5462-11db-a1a9-1b2af84110c9" ns1:packageId="ReceiptAckPackage15"
ns127:type="simple" xmlns:ns127="http://www.w3.org/1999/xlink">
  <ns1:BusinessTransactionCharacteristics ns1:isAuthenticated="persistent"
  ns1:isAuthorizationRequired="true" ns1:isConfidential="persistent"
  ns1:isIntelligibleCheckRequired="false" ns1:isNonRepudiationReceiptRequired="true"
  ns1:isNonRepudiationRequired="true" ns1:isTamperProof="none"/>
  <ns1:ActionContext ns1:binaryCollaboration="Record Audit Event"
  ns1:businessTransactionActivity="Record Audit Event ETA"
  ns1:requestOrResponseAction="Record Audit Event Requesting Business Activity"/>
  <ns1:ChannelId>SyncChannel13</ns1:ChannelId>
</ns1:ThisPartyActionBinding>
</ns1:CanSend>
...
</ns1:CanReceive>
</ns1:ServiceBinding>
</ns1:CollaborationRole>
<ns1:DeliveryChannel ns1:channelId="SyncChannel13" ns1:docExchangeId="DocExchange11"
ns1:transportId="Transport12">
<ns1:MessagingCharacteristics ns1:ackRequested="perMessage" ns1:ackSignatureRequested="always"
  ns1:duplicateElimination="always" ns1:syncReplyMode="signalsAndResponse"/>
</ns1:DeliveryChannel>
<ns1:Transport ns1:transportId="Transport12">
  <ns1:TransportSender>
    <ns1:TransportProtocol ns1:version="1.1">HTTP</ns1:TransportProtocol>
  </ns1:TransportSender>
  <ns1:TransportReceiver>
    <ns1:TransportProtocol ns1:version="1.1">HTTP</ns1:TransportProtocol>
    <ns1:Endpoint ns1:uri="http://127.0.0.1:6666"/>
  </ns1:TransportReceiver>
</ns1:Transport>
<ns1:DocExchange ns1:docExchangeId="DocExchange11">
  <ns1:ebXMLSenderBinding ns1:version="2.0"/>
  <ns1:ebXMLReceiverBinding ns1:version="2.0"/>
</ns1:DocExchange>
</ns1:PartyInfo>
<ns1:SimplePart ns1:id="MsgHdr" ns1:mimetype="text/xml">
  <ns1:NamespaceSupported ns1:location="http://www.oasis-open.org/committees/ebxml-msg/
  schema/msg-header-2_0.xsd" ns1:version="2.0">http://www.oasis-open.org/committees/
  ebxml-msg/schema/msg-header-2_0.xsd</ns1:NamespaceSupported>
</ns1:SimplePart>
<ns1:SimplePart ns1:id="ReceiptAcknowledgment" ns1:mimetype="application/xml">
  <ns1:NamespaceSupported ns1:location="http://docs.oasis-open.org/ebxmlbp/ebbp-signals-2.0"
  ns1:version="2.0">http://docs.oasis-open.org/ebxmlbp/ebbp-signals-2.0</ns1:NamespaceSupported>
</ns1:SimplePart>
...
<ns1:Packaging ns1:id="MshSignalPackage">
  <ns1:ProcessingCapabilities ns1:generate="true" ns1:parse="true"/>
  <ns1:CompositeList>
<ns1:Composite ns1:id="MshSignal" ns1:mimeparameters="type=text/xml" ns1:mimetype="multipart/related">
  <ns1:Constituent ns1:idref="MsgHdr"/>
  </ns1:Composite>
</ns1:CompositeList>
</ns1:Packaging>
...
</ns1:CollaborationProtocolAgreement>

```