Models and Languages for Describing and Discovering E-Services

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Tutorial

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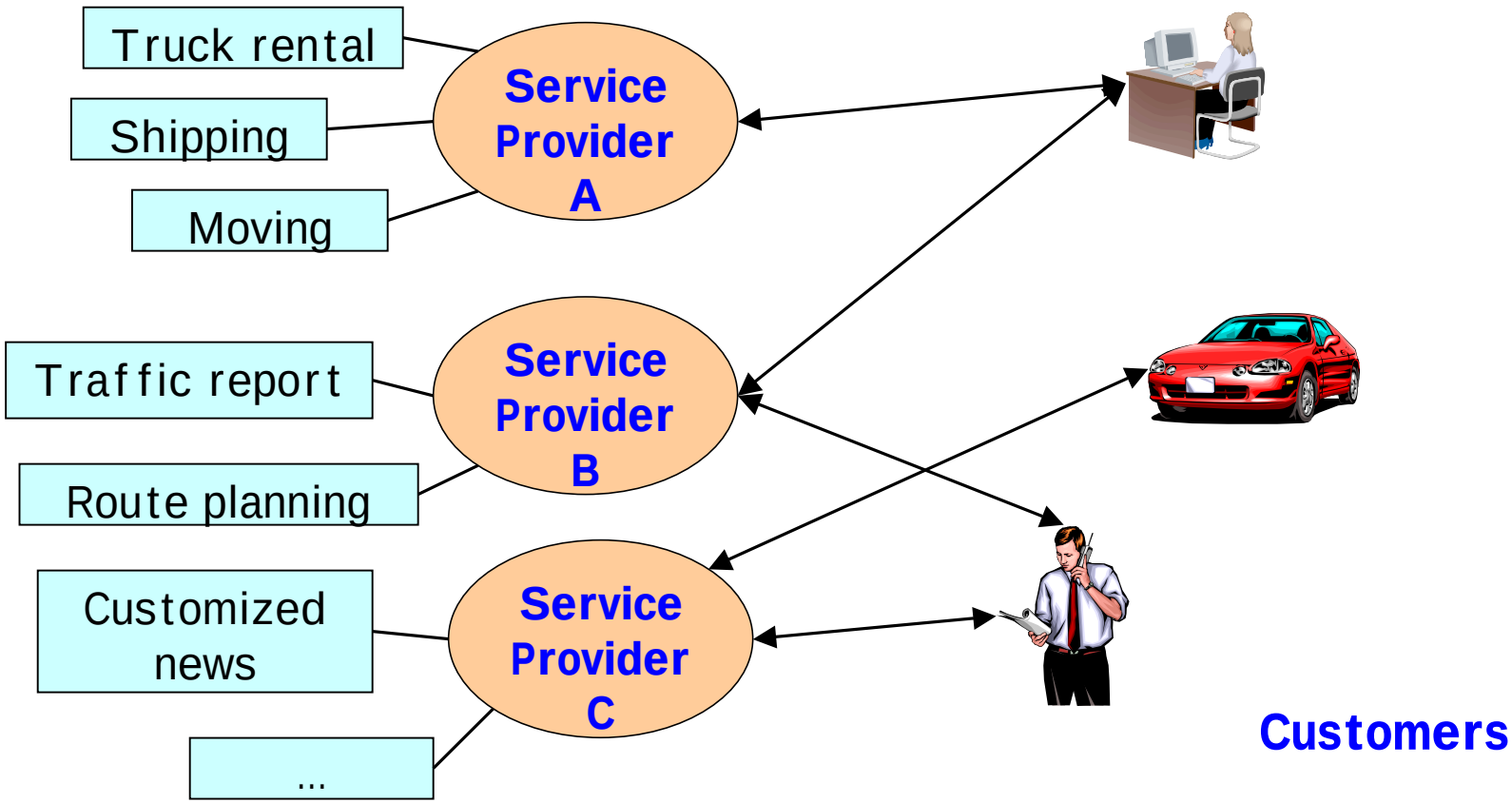
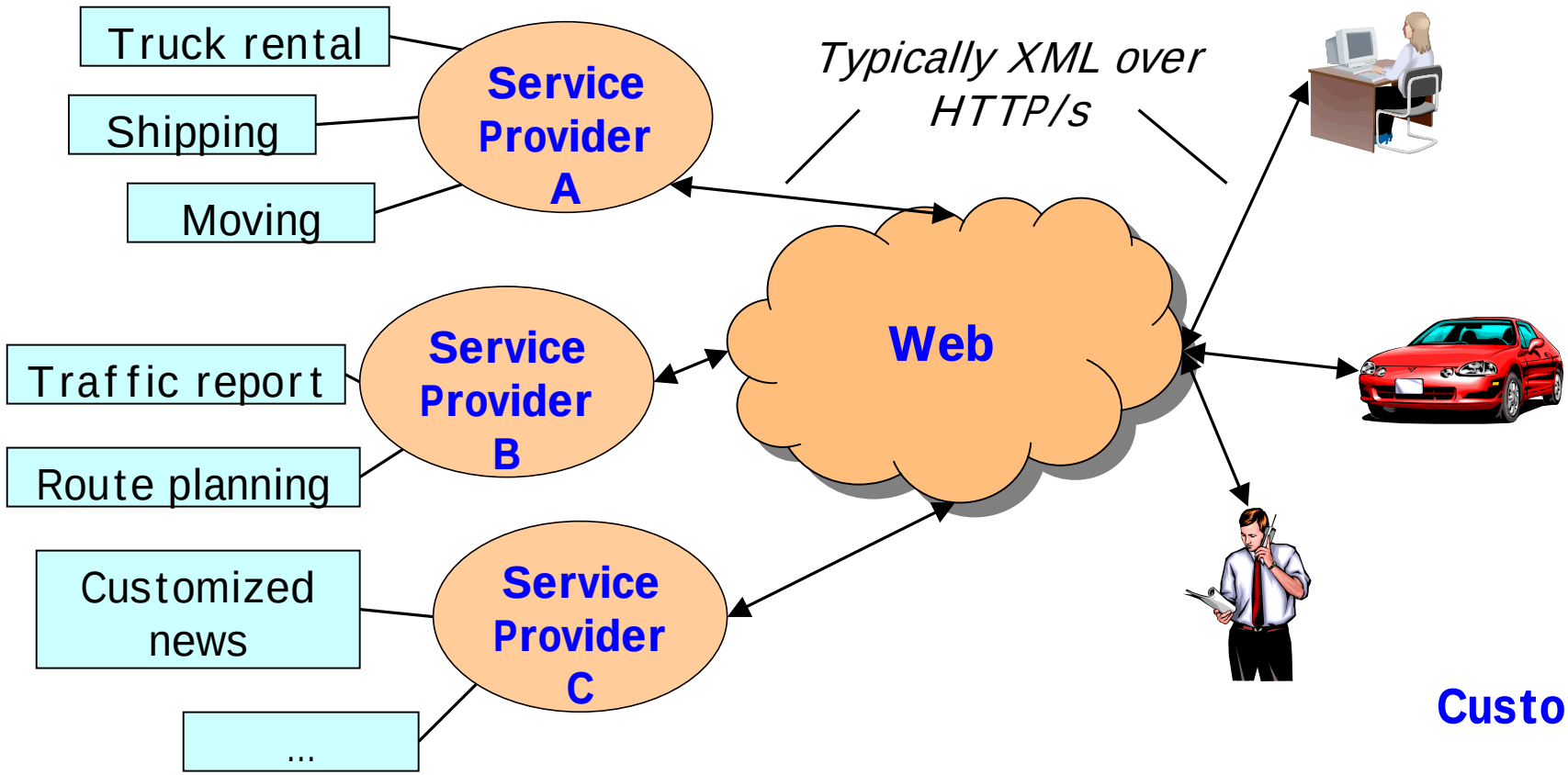
E-Services

- Applications accessible electronically by humans and/or other applications



E-Services, Web Services

- Similar, but “Web Service” puts emphasis on Web technologies.
  - Application accessible using standard Internet protocols.



Discovering and Invoking E-Services

Customer needs an e-publishing service

E-publishing service A

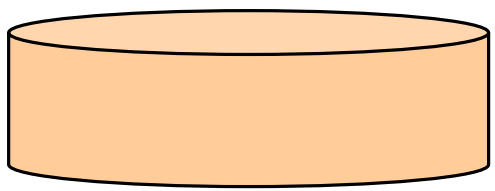
2: Access service detail, Negotiate service quality, Invoke the e-service

E-publishing service B

Customer (or apps on their behalf)

1: Queries an e-service directory (broker) searching for services of interest.

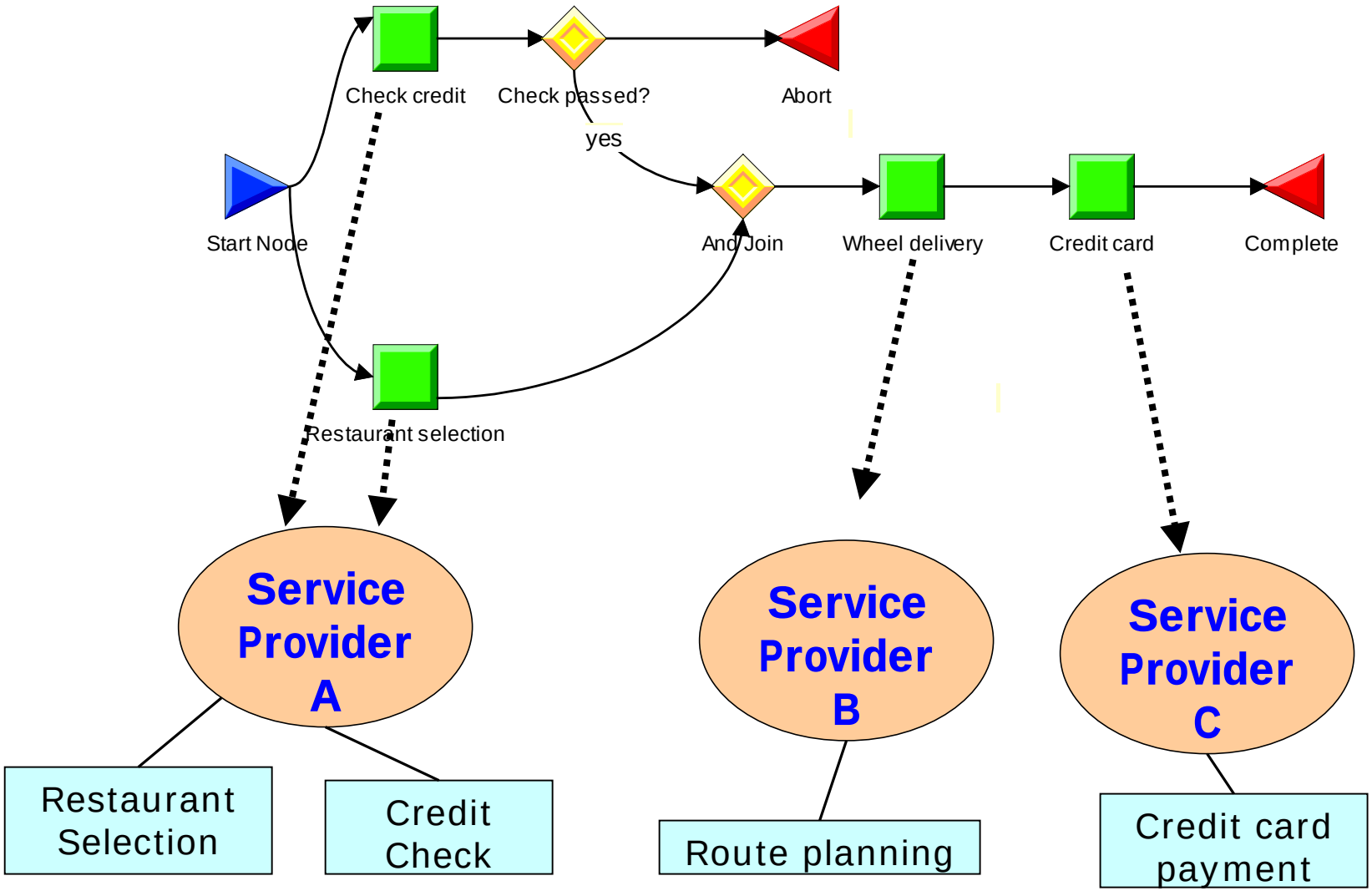
Gets (ranked) list of e-services



E-service directory or broker

E-publishing service C

Dynamic Composition



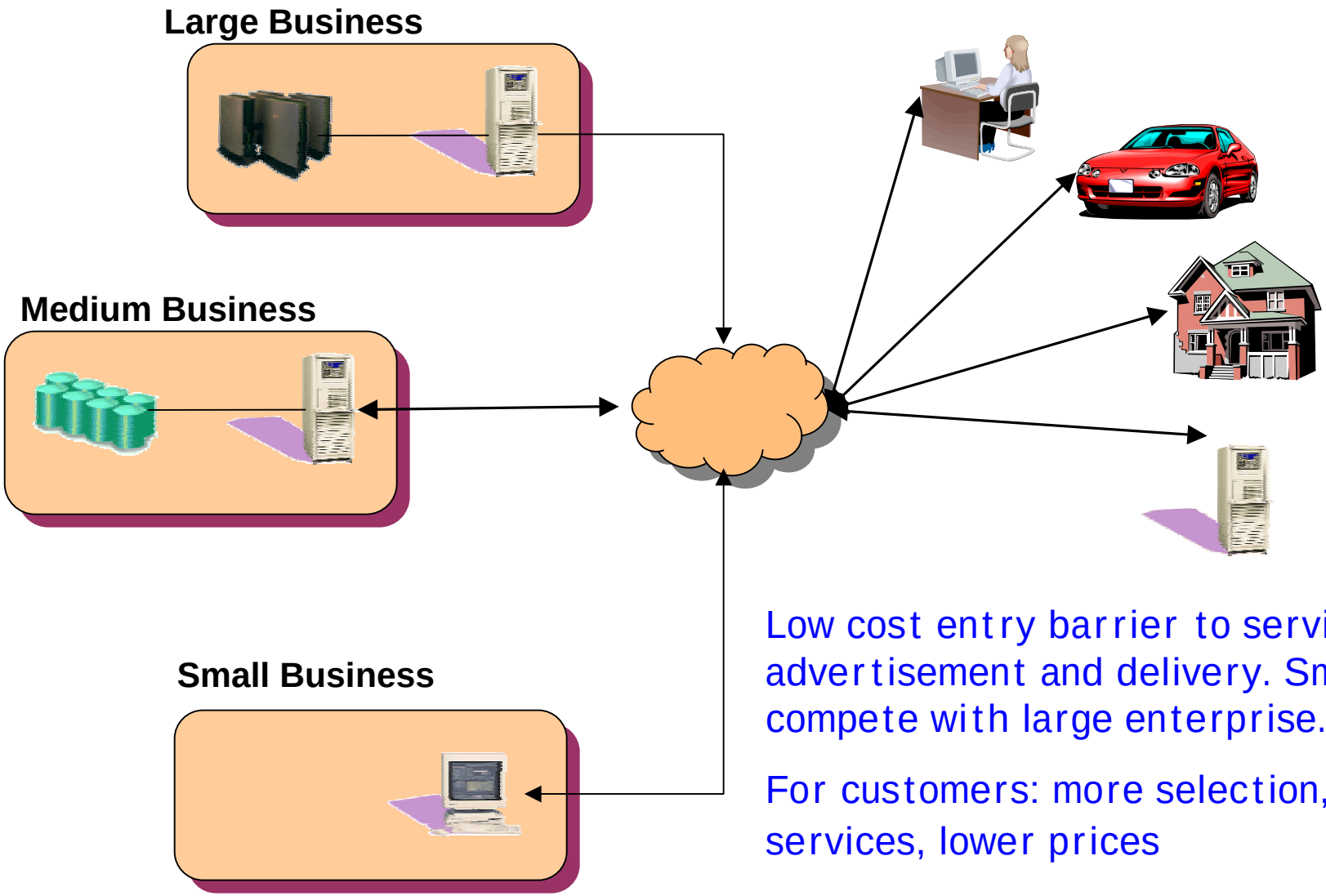
The Evolution of the Internet

- Internet Chapter I
  - Web used to deliver information and perform e-commerce transactions
  - Web applications targeted to human users, manual interaction
- Internet Chapter II
  - A variety of e-services available on the Internet
  - Users, apps can automatically discover the available e-services that best meet their needs at any given time.
  - Service quality negotiation and invocation are also automated.

The Evolution of the Internet (cont.)

Chapter 1	→	Chapter 2
At your desk	→	Living your life
PC only	→	PC+ devices + anything
Web storefronts	→	Automated e-services
Do-it-yourself	→	Do-it-for-me

“Equal Opportunity”



Low cost entry barrier to service advertisement and delivery. Small shops compete with large enterprise.

For customers: more selection, better services, lower prices

How to Get There

- Many issues to be addressed
  - E-service description
  - E-Service advertisement, discovery, and selection
  - E-Service Composition
  - Secure access, delivery
  - E-service development tools
  - E-Service measuring, monitoring, management
  - Middleware infrastructure for e-services
  - …

- In this tutorial we focus on two fundamental problems: e-service description and advertisement/discovery

E-Service Description

- Users dynamically find services on the Web, offered by different providers
- Before accessing the services, they need to know information such as what exact service is offered, at what conditions, how to invoke the service, etc…

→ The different characteristics of an e-service must be described so that users know what the service offers and how to use the service

E-publishing service

Characteristics of an E-Service

- Type of service offered
- Interface
  - Operations
  - Bindings
- Interaction (Conversations)
- Transaction
- Properties, constraints

Service Type

- Detailed description of what service is being offered, at what conditions
  - E.g., sell used SUV cars of brand X and Y, trade-ins welcome
- But: it has to be machine-readable
- Back to the ontology problem…
  - Standard ontology? Slow, inflexible, rarely fits needs
  - Provider-specific ontology? How can users understand it?

Service Type –Vocabularies

- Individual providers and standard bodies can define vocabularies
- Providers can then describe services using one or more predefined vocabularies
- Vocabularies could themselves be e-services
  - Can be discovered, accessed with same mechanisms

<Description ServiceName="xx" Vocabulary="Printing">

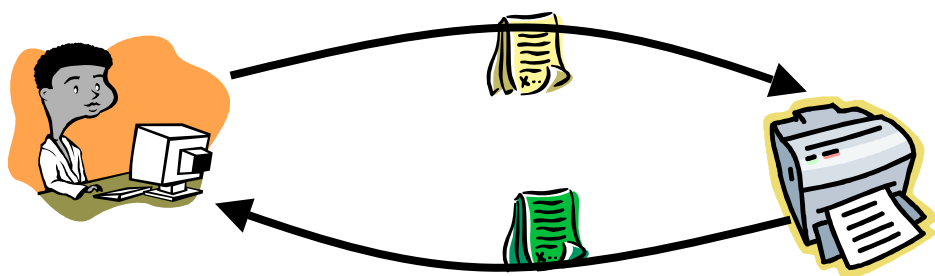
<ProviderName> Printy </ProviderName>

<ShippingArea> Sweden </ShippingArea>

.....

Interfaces

- Purpose similar to IDL descriptions, but in the context of e-services
  - Typically described by an XML document
  - Interface defined in terms of which XML documents the service needs and which XML document (if any) is sent back to the user
- Address
- Binding (HTTP, MIME, …)



Printy

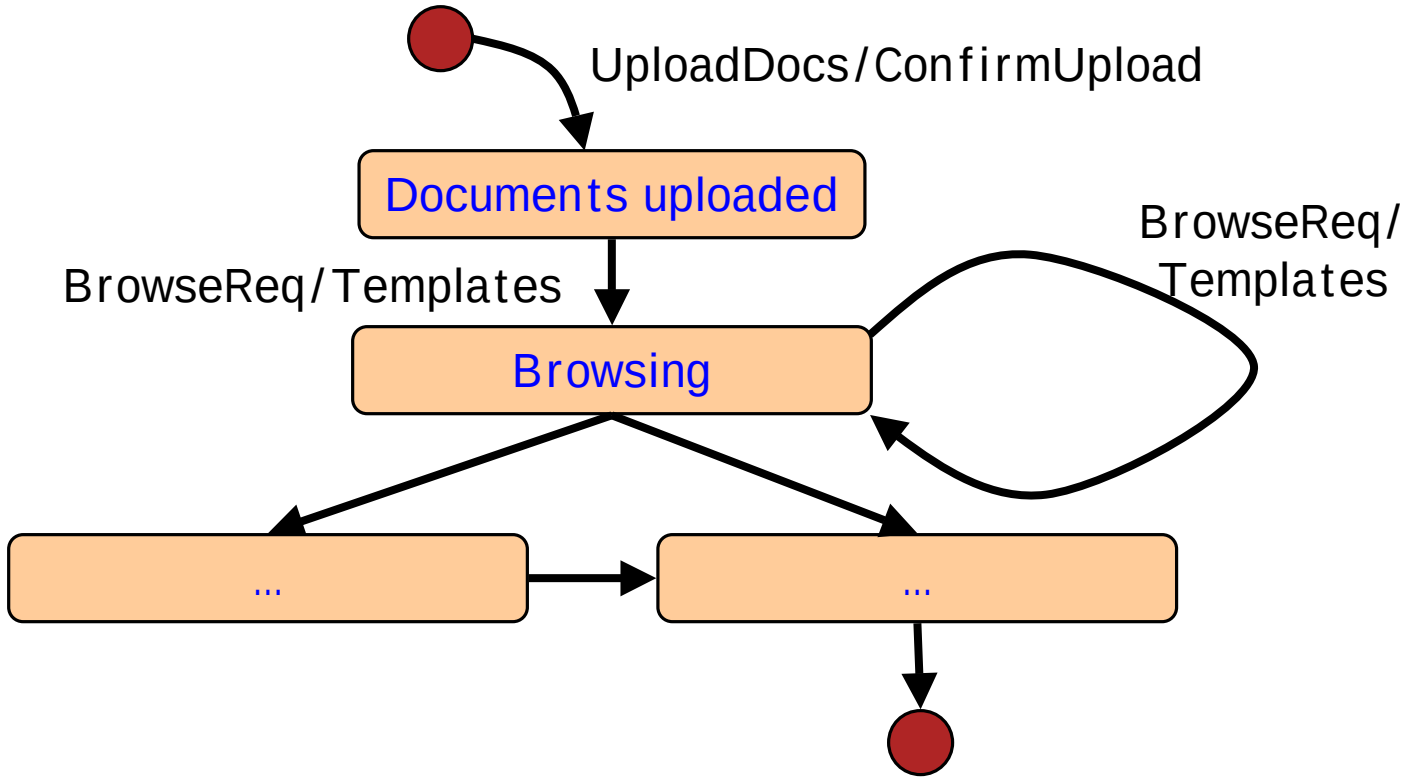
Example

```
<Interaction IntType="DocExchange" id="PrintShip">
  <Input>
    <InputDoc id=" PrintShipRequest"
        IDSchema="http://acme.org/in-xyz.xsd">
    </InputDoc >
  </Input >
  <Output>
    <OutputDoc" id="Invoice"
        ODSchema="http://acme.org/in-xyz.xsd ">
    </OutputDoc>
  </Output>
</Interaction>
```

Conversations

- Set of interactions between a user and a service
- A Conversation Definition Language (CDL) specifies rules and constraints about a conversation
  - Such as the allowed order of operation invocation

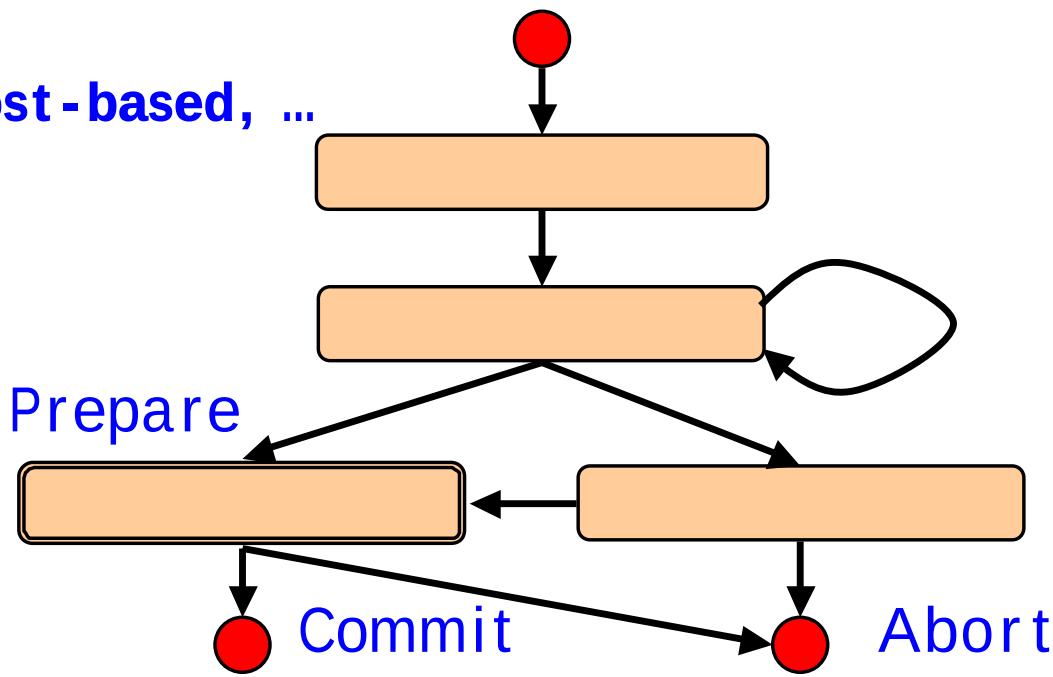
Conversation (cont.)



- Similar to a state machine specification, and to a RosettaNet PIP (NOT a workflow)
- Independent from interface

Transactions

- E-Services may expose transactional properties
  - ACID semantic revisited in e-services context
- “Atomicity”, “two phase commit”, and even a post-commit “rollback” (compensation)
  - **Semantic,** ACID-like properties may be a **negotiable quality parameter**
  - May be **time-based, cost-based, …**



Web Services Description Language (WSDL)

- An XML language for describing e-service interfaces
- Originally proposed in September 2000 by Ariba, IBM, and Microsoft
- Version 1.1 submitted to W3C
  - As a note for the W3C XML Activity on XML Protocols

- URL: http://www.w3.org/TR/wsdl

WSDL

- WSDL describes the operations provided by e-services in an abstract way, as XML document exchanges
- Allows the description of bindings (e.g., SOAP or HTTP)
- Modular
- No built-in support for classification, conversations, transactions

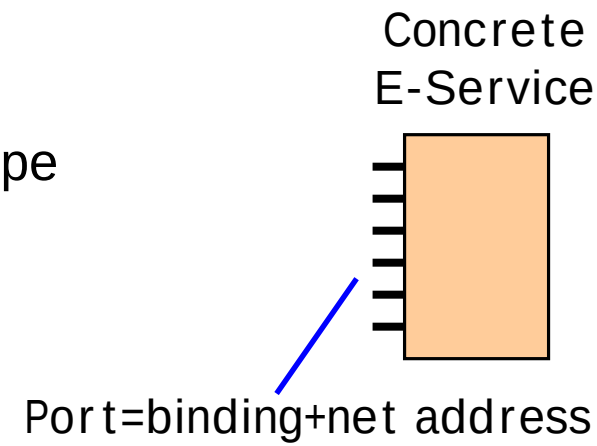
WSDL Elements

- **Types**
- **Messages**: abstract definition of data being exchanged
- **Operation**: abstract description of a method or function
- **Port Type:** a set of (abstract) operations

```
<types><schema [...]>
  <element name="PrintRequest"> [...] </element>
  <element name=".."> [...] </element> </schema></types>

<message name="PrintInput"> <part name="body"
  element="nsp1:PrintRequest"/> </message>
<message name="PrintOutput"> [...]</message>

<portType name=" PrintPortType">
      <operation name="Print">
        <input message="tns: PrintInput"/>
        <output message="..."/>
      </operation> </portType>
```

WSDL Elements (cont.)

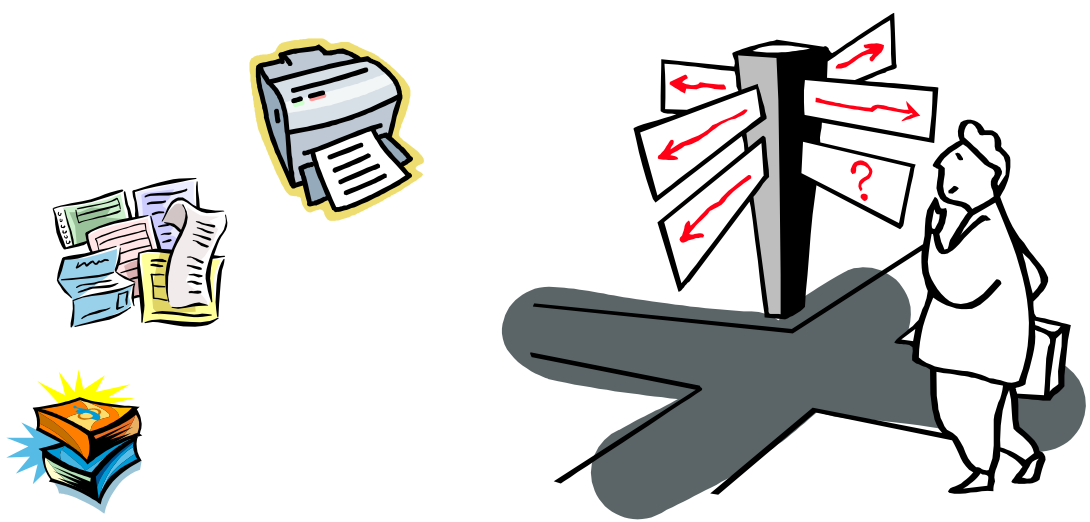
- **Binding:** a concrete protocol for a port type
- **Port:** an address for a binding
- **Service:** a collection of ports




```
<binding name="PrintSoapBinding" [...] >
   <soap:binding style="document"
   transport="http://schemas.xmlsoap.org/soap/http"/>
   <operation name="Print"> [...]
</binding>
<service name="PrintService"> <documentation>Great
   print service</documentation>
   <port name="PrintPort" binding="tns:PrintBinding">
   <soap:address location="http://..."/> </port>
</service>
```

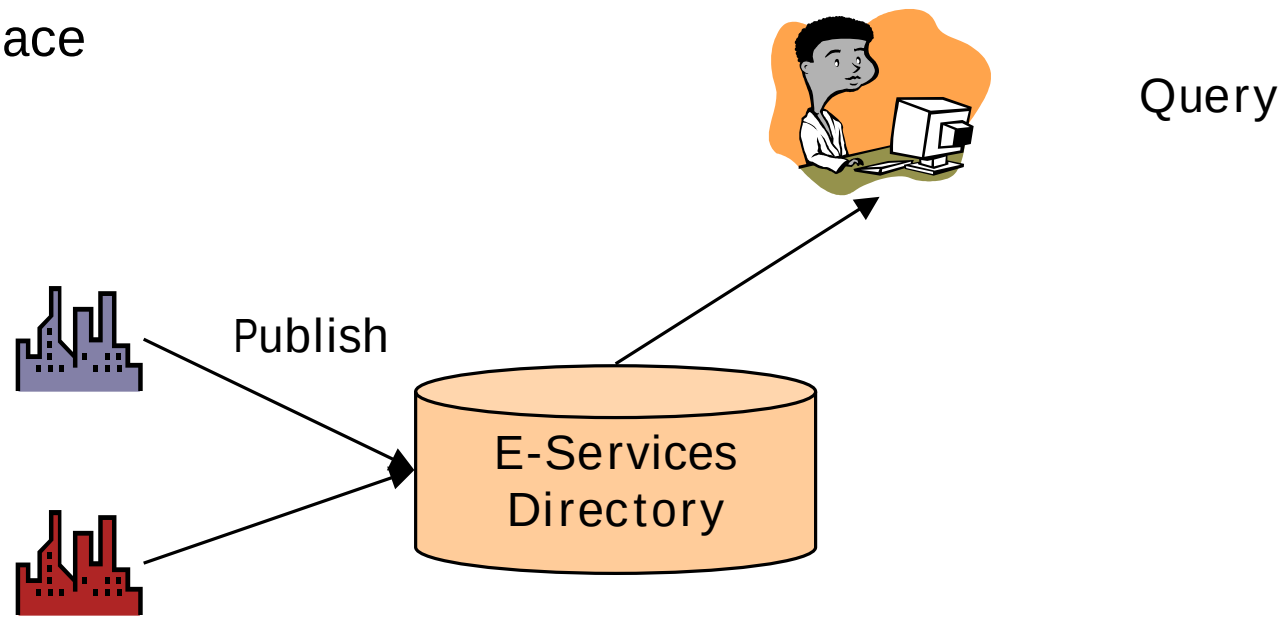
E-Service Discovery

- The beauty of the e-services vision is the ability to find the currently available service that best fits my need.
  - How can I know what services are available? How can I find which services fit my needs?
  - How can I know where to get detailed information on how to use a service?



Directories

- Would be useful to have machine-readable service directories. Issues:
  - What to describe, how to describe it, who describes it?
  - Structure of the directory and classification of services and service providers
  - Interface



Directory Content

- Different levels of details

- List of companies and services, plus contact information

- Categories

- Detailed information on how to access a service (URL, interface, bindings, etc)

Structure and Classification

- Entries in a directory may be divided in categories
  - Categories and subcategories very useful for searching the directory
- Issues:
  - Who defines and manages the categories? Controlled or open model?
  - Who puts services and businesses into the appropriate categories?
- Difficult to agree on predefined categories, taxonomies

Directory API and Access Control

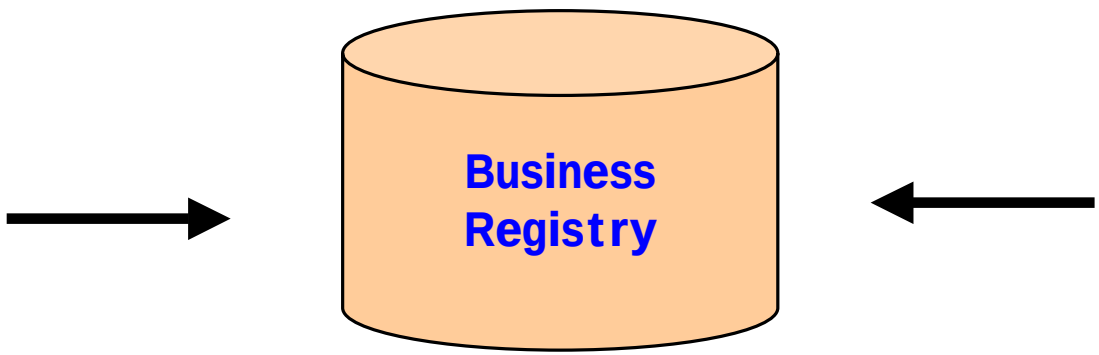
- Query API
  - Find by types, properties, context, interfaces
  - Open vs restricted access
- Publish API
  - Push vs pull
  - Who can publish?
  - What can users publish? How much data?
  - Validate information?

Universal Description, Discovery, and Integration (UDDI)

- Industry consortium, includes major tech companies
- Defines a way to publish and discover information about e-services
  - Format, API, and framework for e-service directories
- Currently 15+ peer members in the committee
- V1: September 2000
- V2: June 2001
- URL: http://uddi.org

Business Registry

- Repository of information about services and service providers
  - UDDI defines the **format** of the information in the registry and the **API** to access it
  - Rules for **operators** implementing a UDDI registry within UDDI net



Companies register information about them and their services

Customers query the registry to find the services they need and learn how to interact with them.

Business Registration

An XML file that describes a business entity and its e-services

- White pages include contact information (e.g., address, phone number, identifiers etc)

- Yellow pages describe businesses and services according to several taxonomies

- Green pages provides detailed technical information about the service

Business Registration: Service Providers

- <businessEntity>
  - Contains information about a company (or division) and the services it offers
    - key
    - authorizedName (publisher of the information)
    - **name***
    - **Description***
    - Operator
    - **Contacts** (phone, email, address, person name,..)
    - **IdentifierBag** (e.g. DUNS)
    - **CategoryBag** (taxonomy)
    - **businessServices: List of services**

Business Registration: Services

<businessEntity>
↳ <businessService>

- <businessService>
  - Contains business information about a service.
    - serviceKey
    - businessKey
    - **name***
    - **description***
    - **CategoryBag** (taxonomy)
    - **bindingTemplates:** detailed technical information

businessService Example

```
<businessService businessKey="..." serviceKey="...">
   <name>ePrintService</name>
   <description xml:lang="en"> Compose, print, and ship brochures
   </description>
   <bindingTemplates>
         <bindingTemplate> [..] </bindingTemplate>
         <bindingTemplate> [...] <bindingTemplate>
         [...]
   </bindingTemplates>
</businessService>
```

Business Registration: Technical Service Description

<businessEntity>
↳ <businessService>
↳ <bindingTemplate>

<bindingTemplate>

- Technical information about a service.
  - bindingKey
  - serviceKey
  - **accessPoint**: Attribute-qualified string (Mail, http/s, telephone, fax,..)
  - **hostingRedirector** (refers to another bindingKey)

XOR

  - **tModelInstanceDetails**
    - How to interact with the service at the specified address
    - Can be empty

bindingTemplate Example

```
<bindingTemplate bindingKey=“..” serviceKey=“..”>
        <accessPoint urlType="http"> http://… </accessPoint>
            <tModelInstanceDetails>
                <tModelInstanceInfo tModelKey="...">
                </tModelInstanceInfo>
            <tModelInstanceDetails
</bindingTemplate>
```

Business Registration: Technical Service Description (details)

<businessEntity>
↳ <businessService>
↳ <bindingTemplate>
↳ <tModelInstanceInfo>

<tModelInstanceInfo>

- Detailed technical information
  - **tModelKey** defines technical fingerprint (reference)
  - **description***
  - **instanceDetails**
    - E.g., parameter settings, default values

Technical Model (tModel)

- Information on how to interact with a service
  - NOT a service description language
  - From the tModelKey, users know the compliance with a specification (Hence: how to interact)
  - E.g., can refer to a Rosettanet PIP, a WSDL service interface

- Independent from specific implementations.

- Very simple structure:
  - Key, operator, authorizedName
  - **Name**
  - **description***
  - **overviewDoc**
  - **indetifierBag, categoryBag** identification and taxonomy information

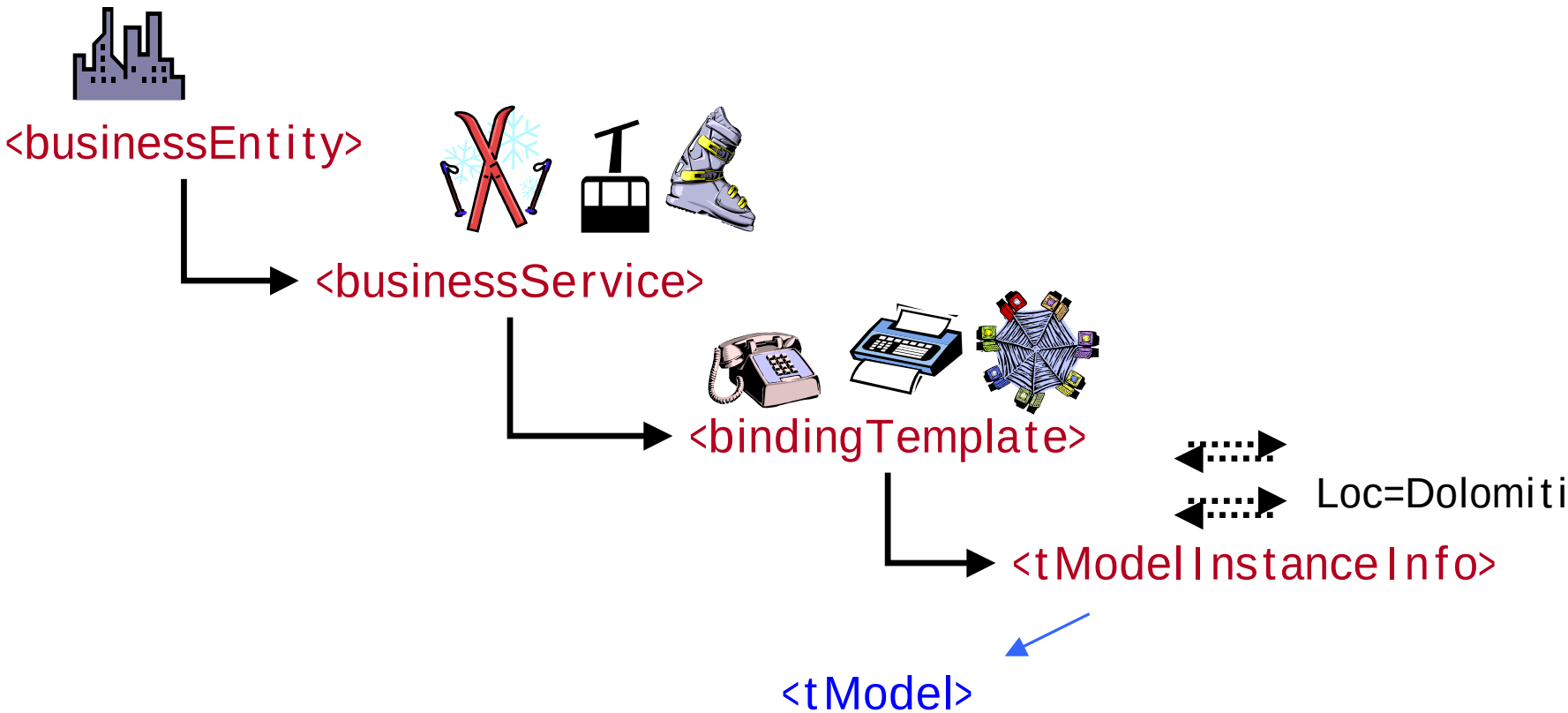
tModel Example

```
<tModel authorizedName="..." operator="..." tModelKey="...">
        <name>ePrint Service</name>
        <description xml:lang="en">
          WSDL description of a print service interface
        </description>
        <overviewDoc>
                <description xml:lang="en">WSDL service description
                </description>
                <overviewURL> http://...  </overviewURL>
        </overviewDoc>
        <categoryBag>
                 <keyedReference tModelKey="..."
                                 keyName="uddi-org:types"
                                 keyValue="wsdlSpec"/>
        </categoryBag>
</tModel>
```

Managing Large Enterprises

- <publisherAssertion> defines relationships between two businessEntity
  - Can be used to define divisions that belong to a company
  - <fromKey>
  - <toKey>
  - <keyedReference> defines type of relationship
    - A name,value pair within a tModel

UDDI Structure (summary)



Identifiers

- Can annotate data with identifiers
- Within <businessEntity> and <tModel>
  - tModelKey, keYName, keyValue

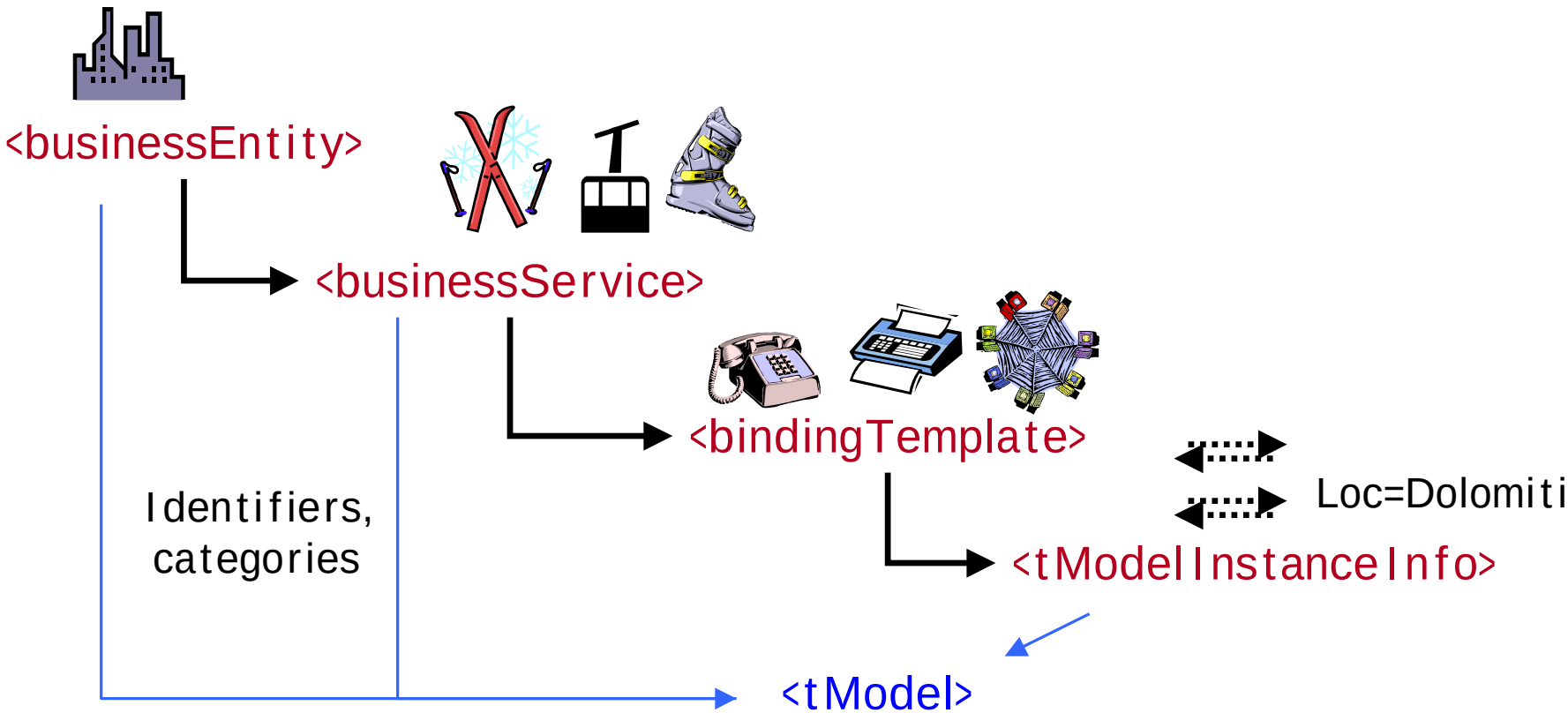
- Can use many types of identifiers (SSNs, DUNS, ..)
- UDDI defines tModels for DUNS and Thomas Register

Categories

- Businesses, services, and tModels can specify the “category” to which they belong
  - Travel agency, Xtreme travels, ..
- Given by service provider
- Information defined as keyed references
  - tModelKey, keYName, keyValue

- Predefined taxonomies (tModels): NAICS (industry codes), UNSPSC (products and services), ISO 3166 (geography)

UDDI Structure (summary)



Publishing a WSDL Service Interface in UDDI

- I want to publish a service interface in WSDL
- Register WSDL description as tModels
  - Classified as “wsdlSpec” with uddi-org:types taxonomy
  - OverviewDoc will point to WSDL document
  - If WSDL description is scattered across many documents, then register several tModels

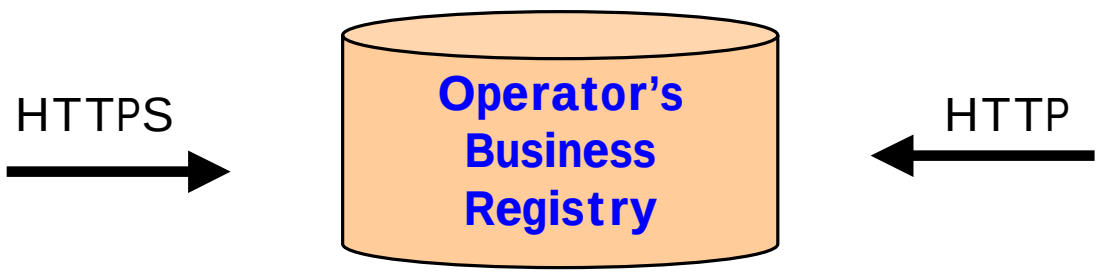
Publishing a WSDL service in UDDI

1. Retrieve the tModel of interest
2. Read the overviewDoc
3. Generate the implementation
4. Publish a new businessService

A tool can automate this process

UDDI API

- *Inquiry* and *Publisher* API
  - Inquiry: search/browse information
    - Open, no security, access control
  - Publisher: publish and manage information
    - Requires registration with operator, service level agreements
    - Secure and controlled interaction (security and access control features are operator-specific)



Publisher API: Companies register information about them and their services

Inquiry API: Customers query registry to find services they need and learn how to interact.

Inquiry API

- Find_xx: overview of registration data.
- Get_xx: detailed info about businessEntity, businessService, bindingTemplate.

<find_binding serviceKey="*uuid_key*" *[maxRows*="nn"] *generic*="2.0"
xmlns="urn:uddi-org:api_v2" >
[<*findQualifiers*/>]
<tModelBag/>
</find_binding>

Publisher API

- Save_xx: add/update entries in the registry
- Delete_xx: delete entries
- Get_xx: Info about docs registered by a company

```
<delete_binding generic="2.0" xmlns="urn:uddi-org:api_v2" >
        <authInfo/>
        <bindingKey/> [<bindingKey/> …]
</delete_binding>
```

UDDI Operators

- Implement publish and inquiry API
  - Control access to information. They are “custodian” of information published at their site.
  - Validate documents (also trims spaces, fields; checks taxonomies, UUID references)
  - Assign UUIDs
- Replicate information with other operators
  - Global replication every 12 hours

Tier 1 and Tier 2 Operator Accounts

- Tier 1 may only create a limited number of entities
  - businessEntity: 1
  - businessService per entity: 4
  - BindingTemplates per service: 2
  - tModel: 100
  - Relationship: 10

E-Service Interoperability Stack

Interop Stack	Universal Service Interop Protocols (these layers are not defined yet)
	Universal Description, Discovery Integration (UDDI)
	Simple Object Access Protocol (SOAP)
	Extensible Markup Language (XML)
	Common Internet Protocols (HTTP, TCP/IP)

Source: UDDI Technical White Paper – September 2000

Simplicity

- No WSDL-like service description language
  - It is complementary to UDDI
- Open identification and categorization model
  - Classification defined by service provider, with limited validation
- UDDI definitions and interfaces are simple
  - Advanced discovery mechanisms to be provided by portals, marketplaces

ebXML – Introduction

- electronic business XML (ebXML) is an international initiative established (in 11/1999) by the United Nations Centre for Trade Facilitation and Electronic Business (UN/CEFACT) and the Organization for the Advancement of Structured Information Standards (OASIS).

- The ebXML vision is to deliver "A single set of internationally agreed upon technical specifications that consist of common XML semantics and related document structures to facilitate global trade"

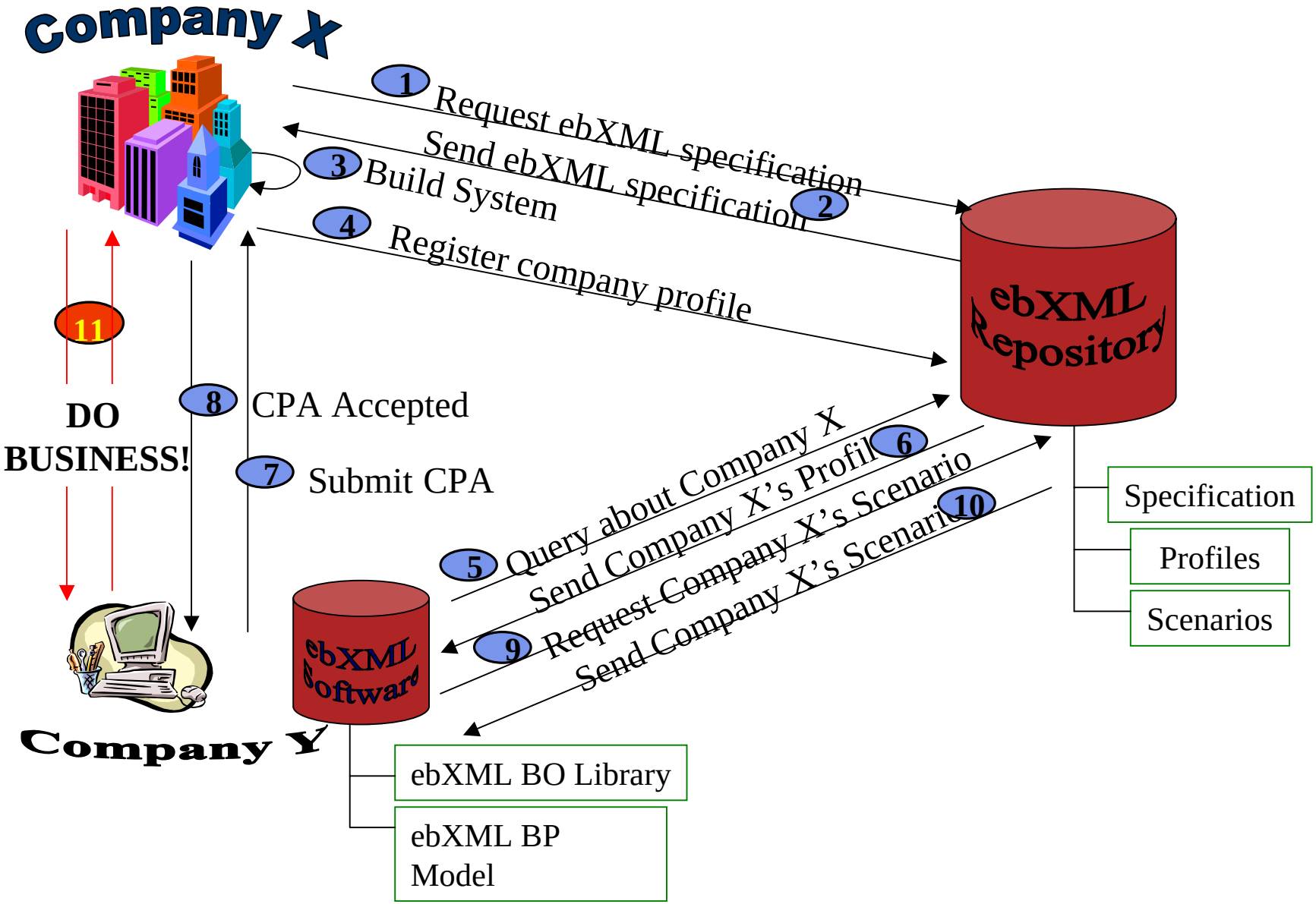
- It is targeted at every sector of the business community, from international conglomerate to small sized enterprise engaged in B2B and B2C trade.

- Currently, 7 project teams are chartered by its steering committee:
  - Business process
  - Technical architecture
  - Core components
  - Transport/routing and packaging
  - Registry and repository
  - Technical coordination and support
  - Marketing, awareness and education

ebXML – Business Requirements

- A single, simple, consistent approach to using XML for electronic business processes in both the B2B and B2C environments.
- Support for both vertical and horizontal solutions regardless of the sophistication of the user.
- Support for a range of implementations from basic, low cost solutions for SME deployment, to comprehensive, complex implementation for large enterprises.
- Fully interoperable transport, routing, and packaging solutions.
- Security solutions that meet business confidentiality requirements.
- An open development process with no barriers to entry.

ebXML Operation Overview

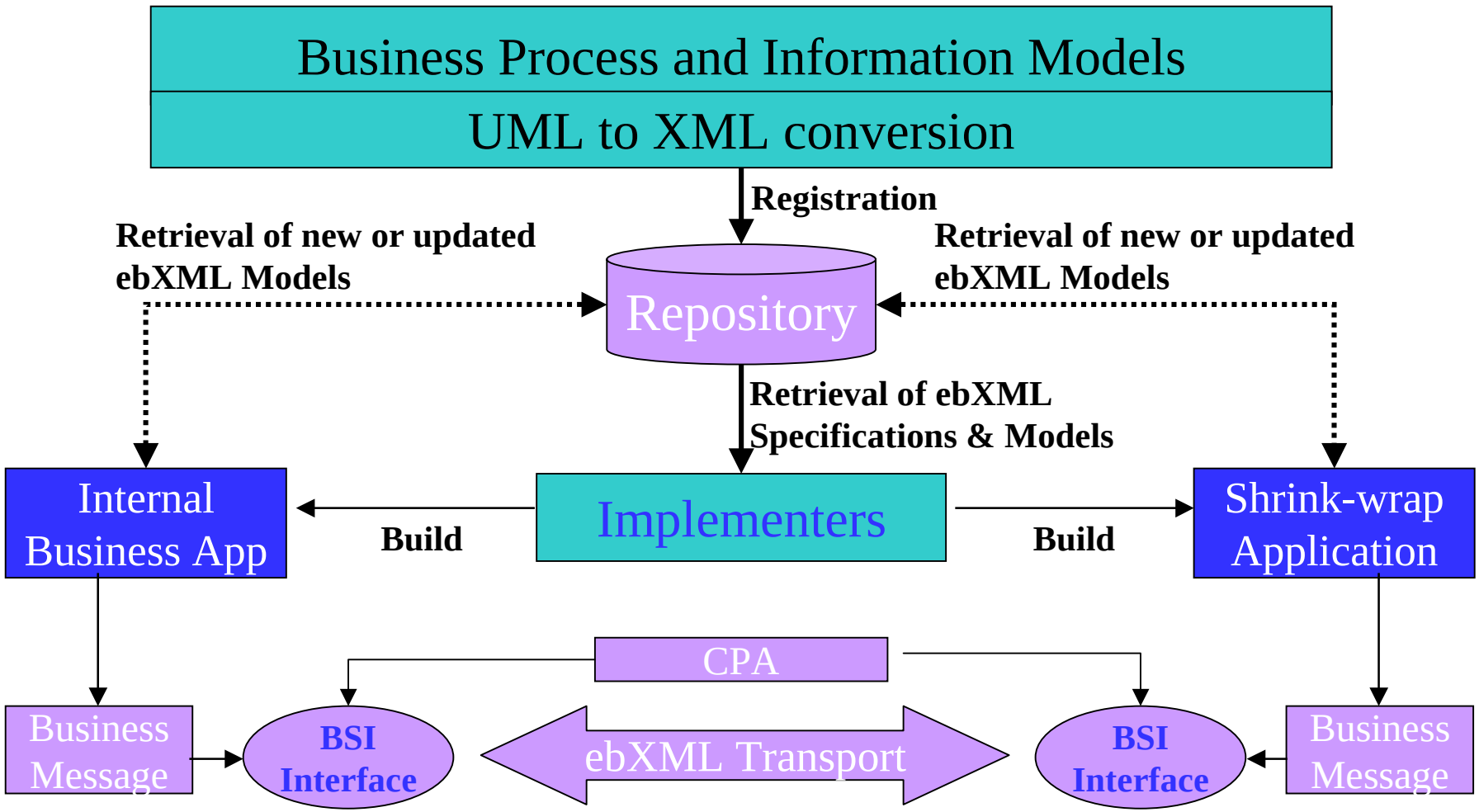


ebXML – Technical Architecture

The ebXML architecture will provide:

- A way to define business processes and their associated message and content.
- A way to register and discover business process sequences with related message exchanges.
- A way to define company profiles.
- A way to define trading partner agreements.
- A uniform message transport layer.

ebXML Operational Environment



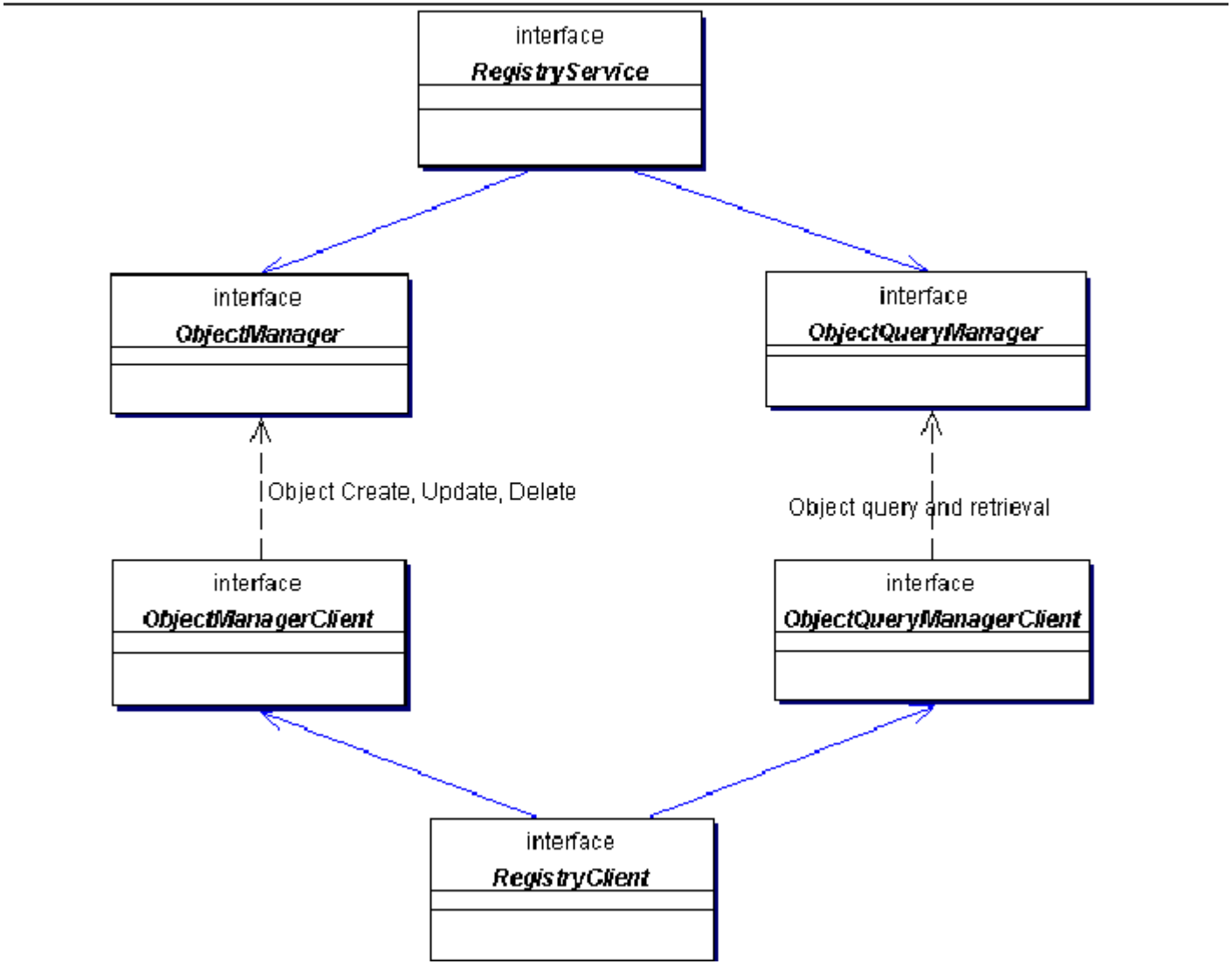
ebXML – Registry and Repository

- A *registry* is a mechanism where by business document and relevant metadata can be registered such that a pointer to their location, and their metadata, can be retrieved as the result of a query.

- A *repository* is a location (or a set of distributed locations) where document pointed at by the register reside and from which they can be retrieved by conventional means (e.g., http/ftp).

- A registry can be established by an industry group or standards organization.

ebXML – Registry Interface



Registry Object Manager Client Interface

Method Summary	
void	**addSlotsAccepted**(RequestAcceptedResponse resp) Notifies client that a previously submitted AddSlotsRequest was accepted by the Registry.
void	**addSlotsError**(ebXMLError error) Notifies client that a previously submitted AddSlotsRequest was not accepted by the Registry due to an error.
void	**approveObjectsAccepted**(RequestAcceptedResponse resp) Notifies client that a previously submitted ApproveObjectsRequest was accepted by the Registry.
void	**approveObjectsError**(ebXMLError error) Notifies client that a previously submitted ApproveObjectsRequest was not accepted by the Registry due to an error.
void	**deprecateObjectsAccepted**(RequestAcceptedResponse resp) Notifies client that a previously submitted DeprecateObjectsRequest was accepted by the Registry.
void	**deprecateObjectsError**(ebXMLError error) Notifies client that a previously submitted DeprecateObjectsRequest was not accepted by the Registry due to an error.
void	**removeObjectsAccepted**(RequestAcceptedResponse resp) Notifies client that a previously submitted RemoveObjectsRequest was accepted by the Registry.
void	**removeSlotsAccepted**(RequestAcceptedResponse resp) Notifies client that a previously submitted RemoveSlotsRequest was accepted by the Registry.
void	**removeObjectsError**(ebXMLError error) Notifies client that a previously submitted RemoveObjectsRequest was not accepted by the Registry due to an error.
void	**removeSlotsError**(ebXMLError error) Notifies client that a previously submitted RemoveSlotsRequest was not accepted by the Registry due to an error.

ebXML – Transport, Routing and Packaging

Describe the required behavior of the underlying messaging system to:

- Realize reliable secure sending and receiving of messages over any network capable of carrying XML.
- Detail the format and structure of the wrapper, header, and any other data within the message – to include signatures and encryption.
- Query ebXML server for the services they support.

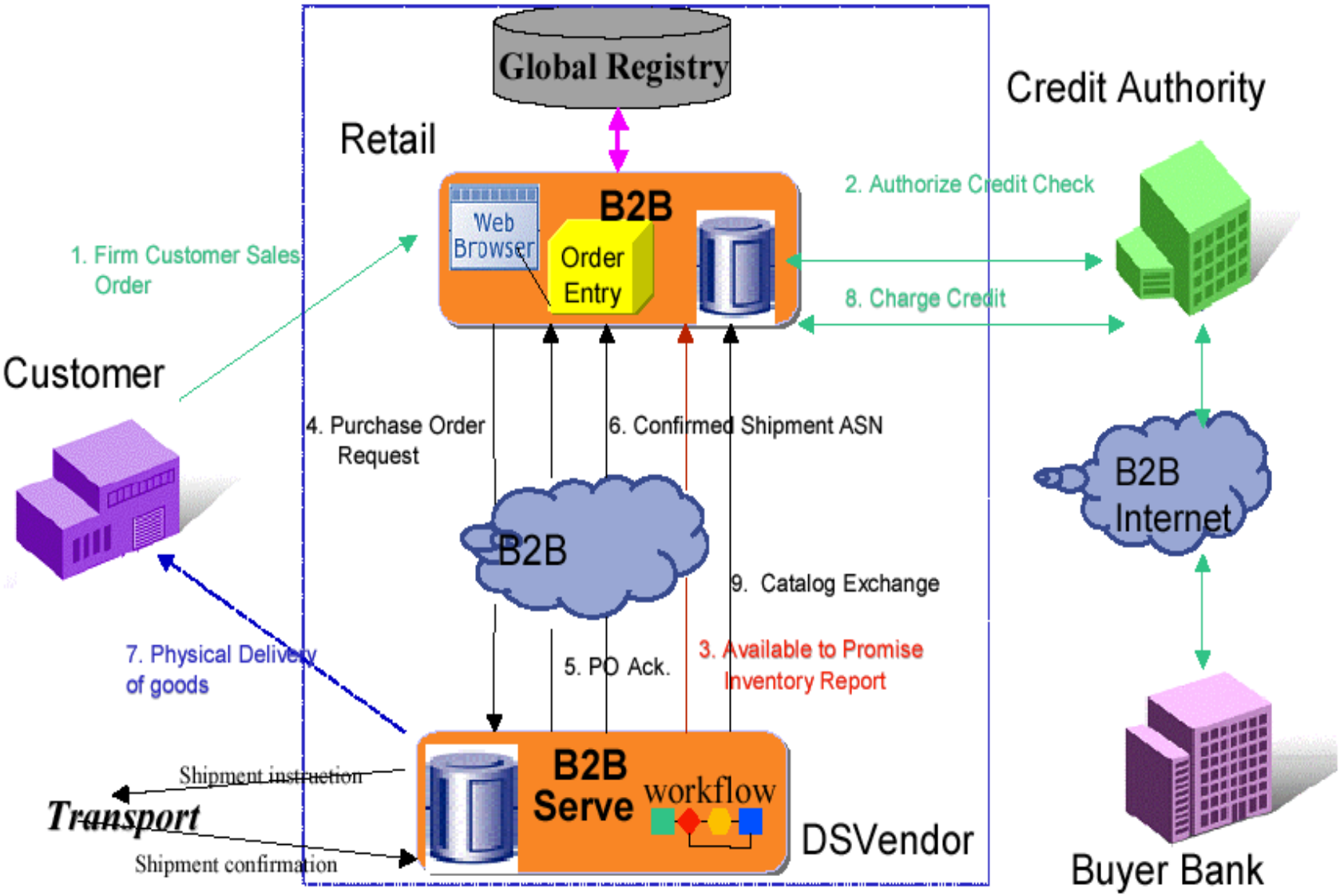
ebXML – Security

Describe the required support at both a session layer or be applied to a single, stand-alone document instance:

- Confidentiality – Only sender and receiver can interpret document contents.
- Authentication of sender/receiver – Assurance of the sender's or receiver's identity.
- Integrity – Assurance that the message contents have not been altered.
- Non-repudiation of origin/receipt – The sender/receiver can not deny having sent/receive the message.

A Complete Example

Direct to Customer Retail



Business Process Analysis

- ebXML business process are defined by the information specified in the ebXML UMM e-Business Process Metamodel.

- The Metamodel specifies all the information that needs to be captured during the analysis of an electronic commerce based business process within the ebXML framework.

* UMM – UN/CEFACT Modeling Methodology N9.0

Business Process Identification/Discovery (Step 1)

Business reference Model

Name: Direct to customer drop ship retail model

Business Areas: Direct To Customer Retail
Finance

Business Area

Name: Direct To Customer Retail

Boundary: Customer, Retailer, Transport Carrier, Direct Supply Retail Vendor (DSVendor), Credit Authority

Process Area: Customer Order Management, Customer Order Fulfillment, Vendor Inventory Management, Product Catalog Exchange

Business Area

Name: Finance

Boundary: Retailer, DSVendor

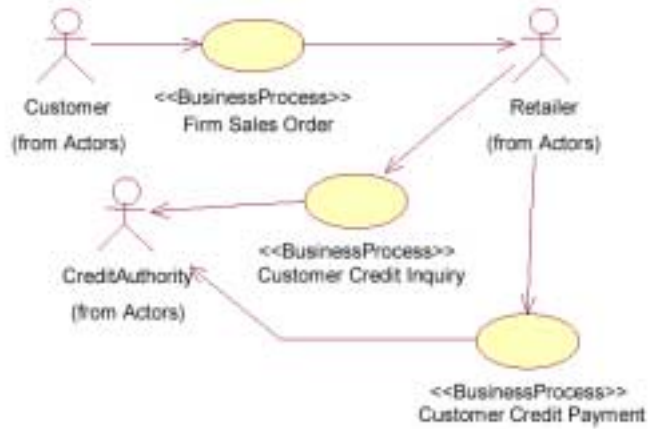
Process Area: Payment

Business Process Identification/Discovery (Step 1)

Process Area

Name: Customer Order Management

Business Processes: Firm Sales Order,
Customer Credit Inquiry,
Customer Credit Payment

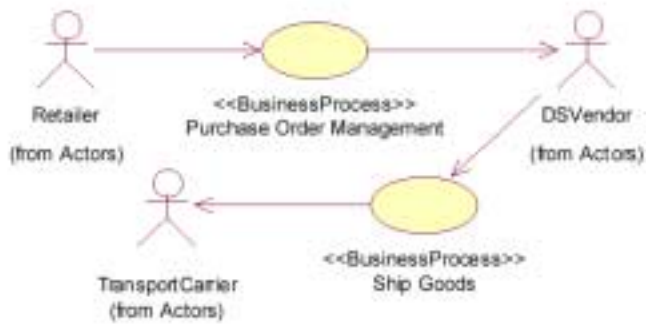


<<ProcessArea>>Customer Order Management

Process Area

Name: Customer Order Fulfillment

Business Processes: Purchase Order Managemen
Ship Goods

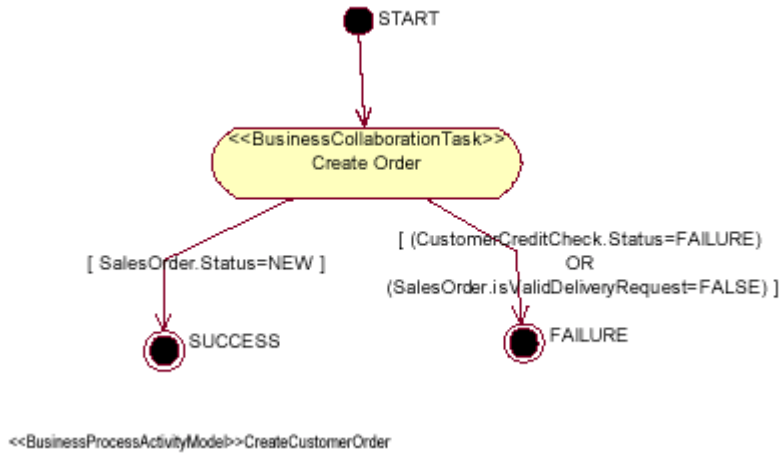


<<ProcessArea>>Customer Order Fulfillment

Business Process Elaboration (Step 2)

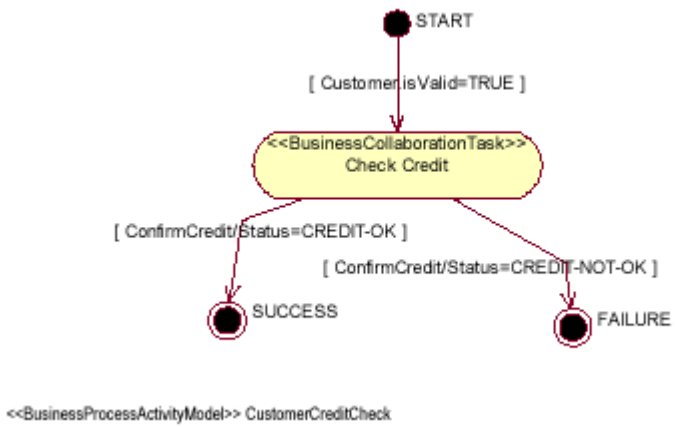
Business Process

Name: Firm Sales Order
Actors: Customer, Retailer
Precondition:
Postcondition:
Exceptions:



Business Process

Name: Customer Credit Inquiry
Actors: Retailer, Credit Authority
Precondition:
Postcondition:
Exceptions:



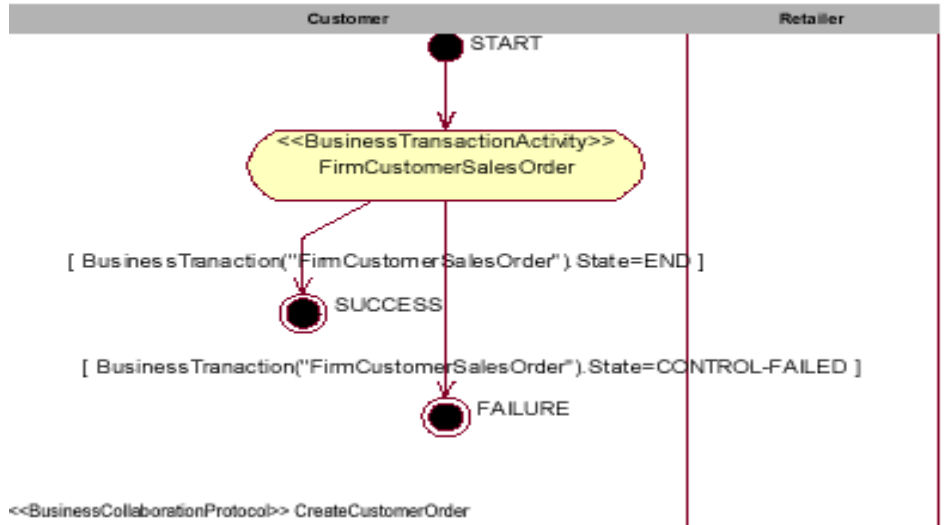
Business Collaboration & Economic Events (Step 3)

Business Collaboration

Id: bcid.ean.12:CreateOrder$1.0

Partner Types: Customer, Retailer

Authorized Roles:



Form: Business Collaboration Protocol Table				
Form Id	BCPT-7.1-Create-Customer-Order			
Identifier	bcid:ean.1234567890128:CreateCustomerOrder$1.0			
From Business Activity (Transaction)	**Initiating Partner Type**	**Business Activity**	**Responding/ Receiving Partner Type**	**Transition Condition**
START	Customer	Create Order	Retailer	NONE
Create Order	NOT-APPLICABLE	SUCCESS	Customer	BusinessTranaction("FirmCustomerSalesOrder").State=END]
Create Order	NOT-APPLICABLE	FAILURE	Customer	BusinessTranaction("FirmCustomerSalesOrder").State=CONTROL-FAILED]

Business Transaction & Authorized Roles (Step 4)

Business Transaction

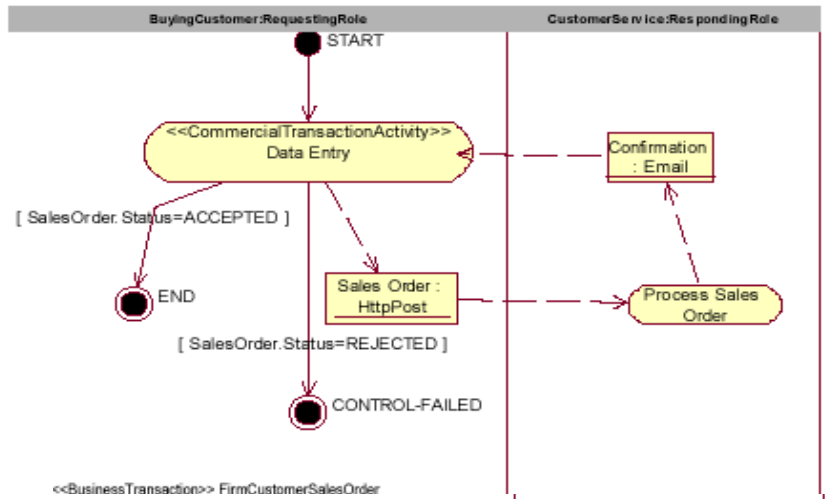
Id:

Business activities & associated roles:

Requesting Partner Type:

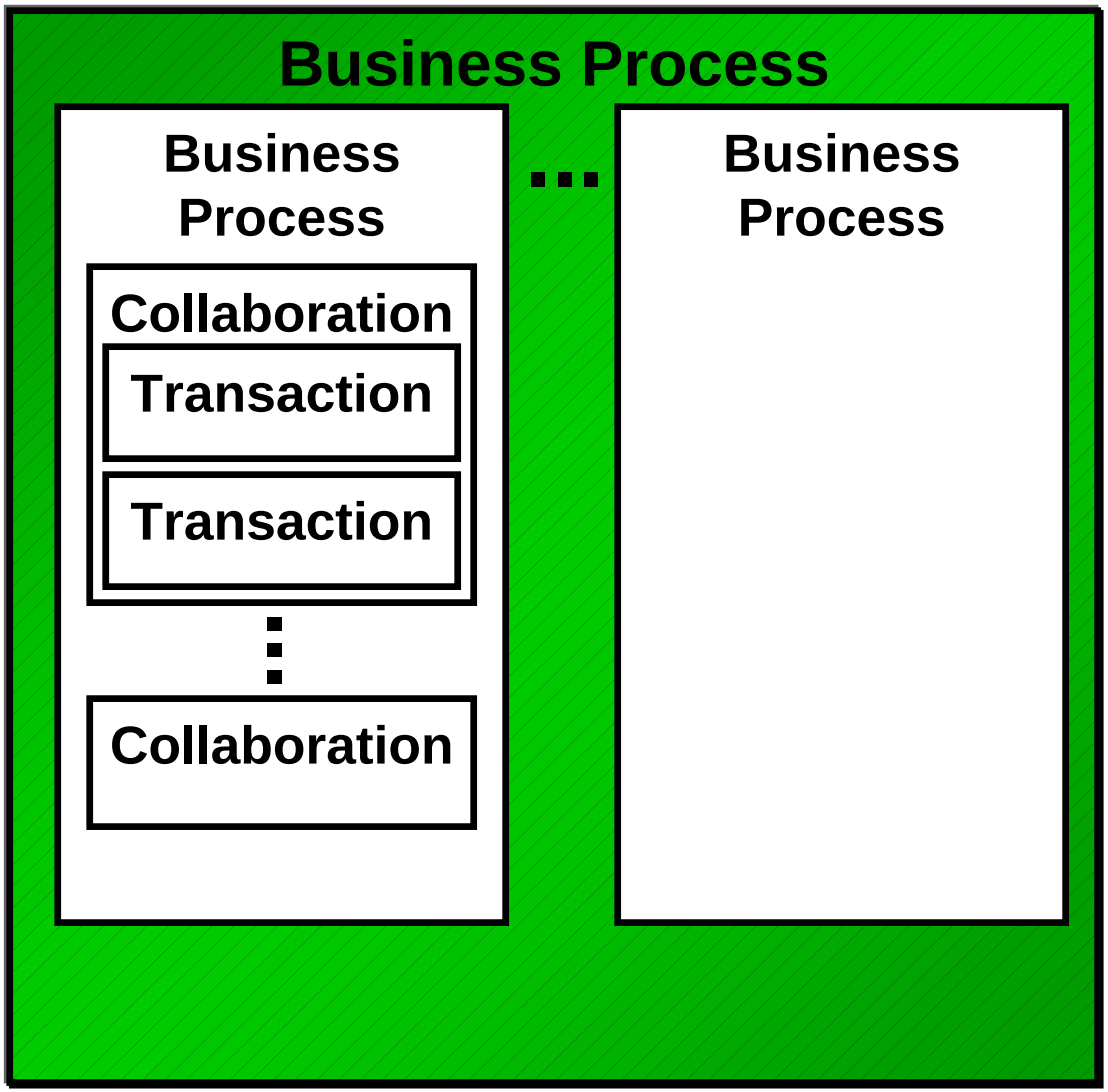
Requesting Activity Role:

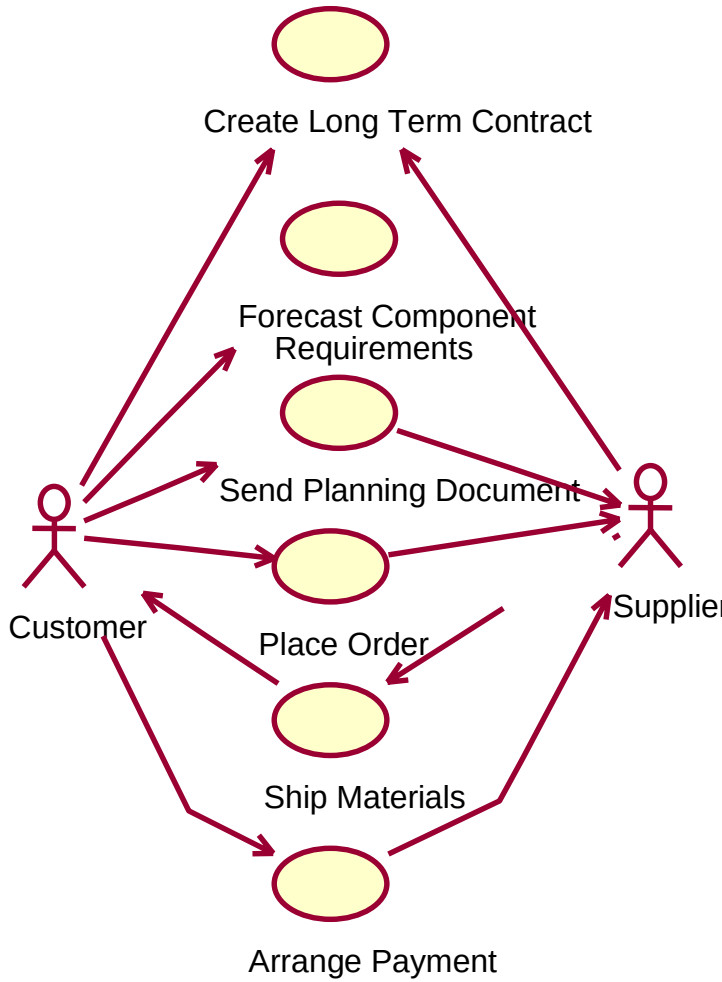
Requesting Activity Document:



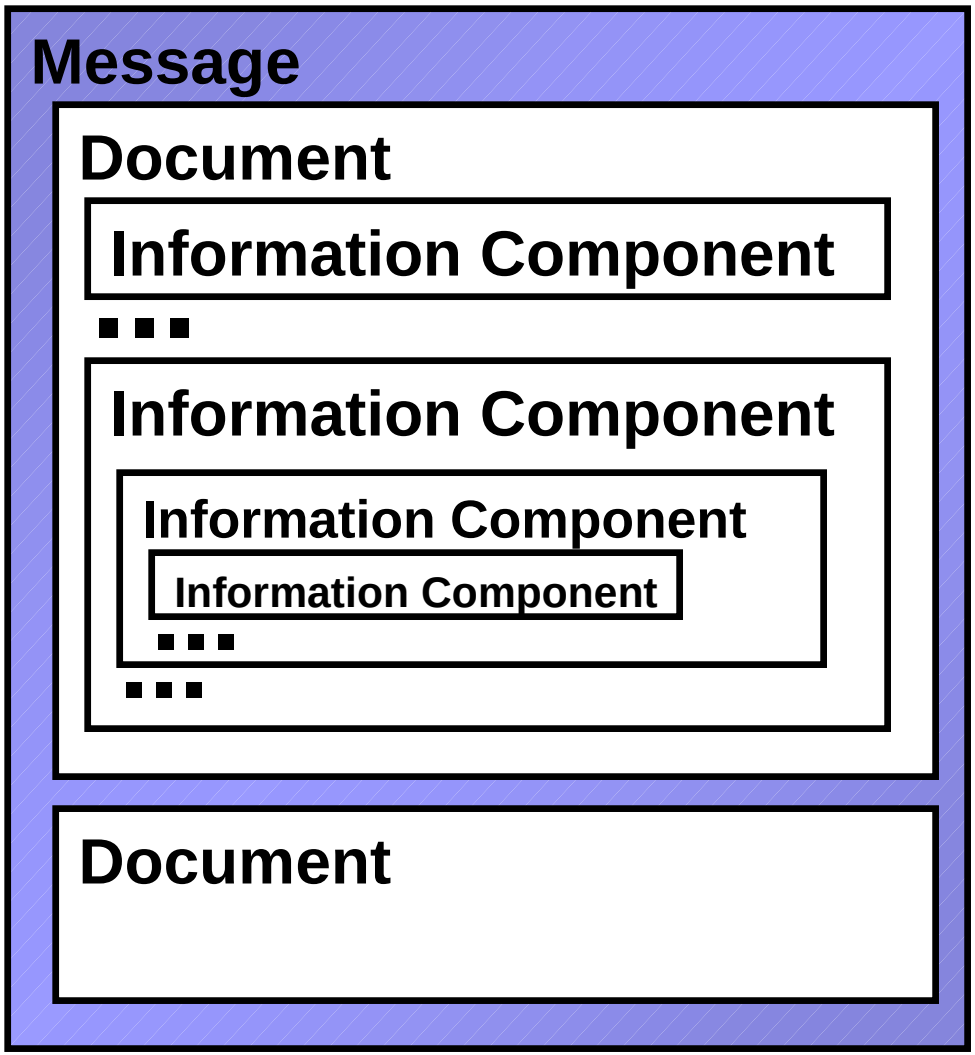
Form: Business Transaction	
Form Id	BT-8.2-Check Customer Credit
Identifier	btid:ean.1234567890128:CheckCustomerCredit$1.0
Description	With complete customer details, including a total sales amount, check the customer's credit ability to eventually pay for product once drop shipped from the vendor.
Pattern	Request/Response (according to UMM)
Agents and Services	
Business activities and associated authorized roles	See BTTT-8.2- Check-Customer-Credit
Constraints	• Valid business agreement with vendor • Valid customer details
Requesting Partner Type	Retailer
Requesting Activity Role	Customer Service
Requesting Activity Document	Credit Check (typically a proprietary document)

ebXML Business Processes



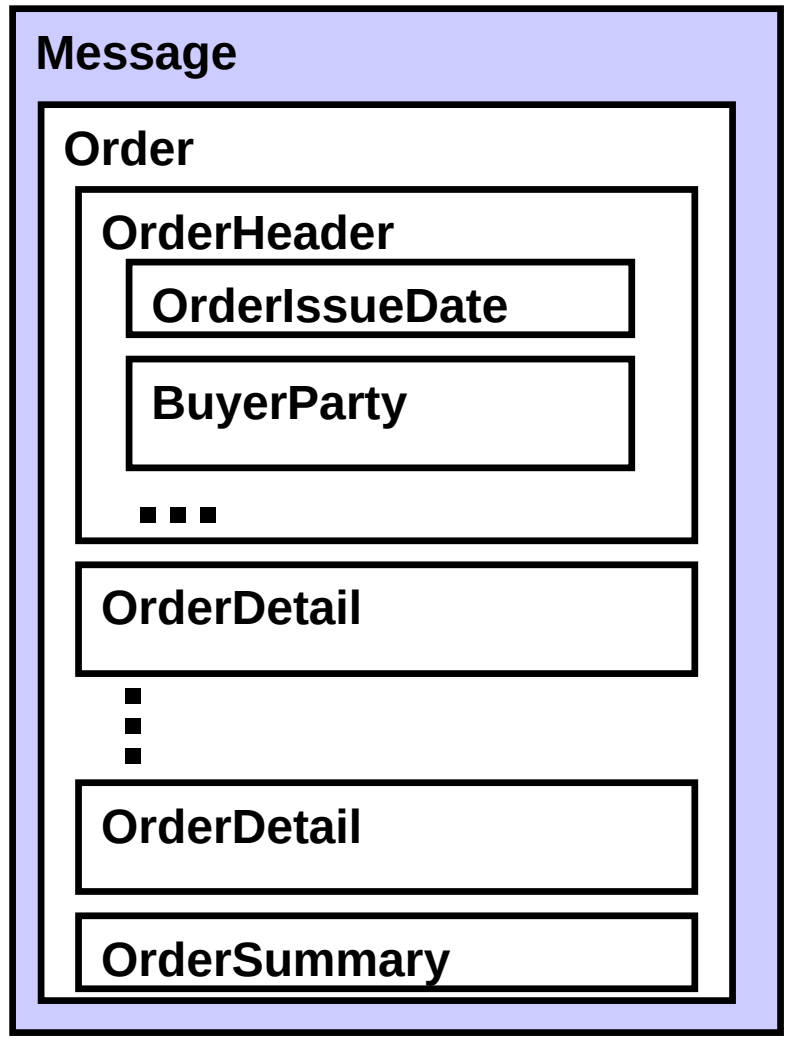


ebXML Business Documents



A business object can be composed of re-usable Core Components.

Example: Purchase Order



Business Process Implementation

- The UMM metamodel is a description of business semantics that allows trading partners to capture the details of a specific business scenario using a consistent modeling methodology.

- However, it may contain more information than what is required for configuring ebXML compliant software.

- The ebXML Business Process Specification Schema is a subset of UMM metamodel. Using it, the user may thus create a business process specification that contains only the information required to configure ebXML compliant software.

- The ebXML Business Process Specification Schema is available in two stand-alone representations, A UML version, and an XML version.

Business Transaction & its Business Document Flow

```
<DocumentSpecification name="ebXML1.0" location="someplace"
                    logicalModel="someplaceAlso">
        <BusinessDocument name=" Purchase Order "/>
        <BusinessDocument name=" PO Acknowledgement "/>
        <BusinessDocument name=" PO Rejection "/>
        <BusinessDocument name="Delivery Instructions"/>
</DocumentSpecification>

<BusinessTransaction name="Create Order">
        <RequestingBusinessActivity name="“
                <DocumentEnvelope isPositiveResponse="true"
                                BusinessDocument="ebXML1.0/PO Acknowledgement">
                        <Attachment
                                name=”DeliveryNotes”
                                mimeType=”XML”
                                BusinessDocument="ebXML1.0/Delivery Instructions"
                                specification=””
                                isConfidential=”true”
                                isTamperProof=”true”
                                isAuthenticated=”true”>
                        </Attachment>
                </DocumentEnvelope>
        </RequestingBusinessActivity>

        <RespondingBusinessActivity name=""
                <DocumentEnvelope isPositiveResponse="true"
                                BusinessDocument="ebXML1.0/PO Acknowledgement"/>
                </DocumentEnvelope>
                <DocumentEnvelope isPositiveResponse="false"
                                BusinessDocument=" ebXML1.0/PO Rejection"/>
                </DocumentEnvelope>
        </RespondingBusinessActivity>
</BusinessTransaction>
```

A Business transaction with one request and two possible responses

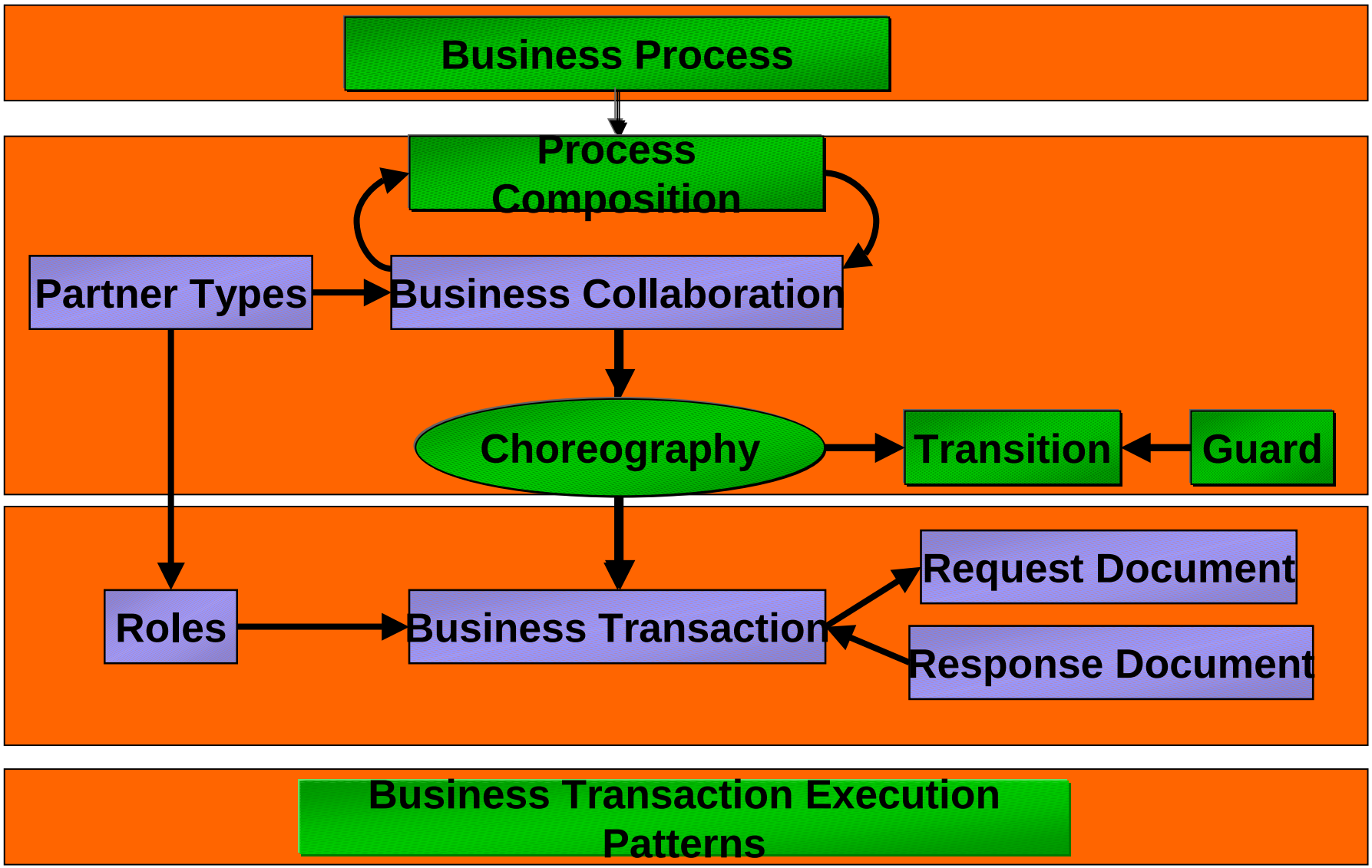
Binary Collaboration

```
<BinaryCollaboration name="Product Fulfillment" timeToPerform="P5D">
    <Documentation>
          timeToPerform = Period: 5 days from start of transaction
    </Documentation>

    <AuthorizedRole name="buyer"/>
    <AuthorizedRole name="seller"/>

    <BusinessTransactionActivity name="Create Order"
            businessTransaction="Create Order"
            fromAuthorizedRole="buyer"
            toAuthorizedRole="seller"
     isLegallyBinding=”true”/>

    <BusinessTransactionActivity name="Notify shipment"
            businessTransaction="Notify of advance shipment"
             fromAuthorizedRole="buyer"
            toAuthorizedRole="seller"/>
</BinaryCollaboration>
```

Binary Transaction Choreography

```
<BinaryCollaboration name="Product Fulfillment" timeToPerform="P5D">
     <Documentation>
          timeToPerform = Period: 5 days from start of transaction
     </Documentation>
     <AuthorizedRole name="buyer"/>
     <AuthorizedRole name="seller"/>
     <BusinessTransactionActivity name="Create Order"
          businessTransaction="Create Order"
          fromAuthorizedRole="buyer"
          toAuthorizedRole="seller"/>
     <BusinessTransactionActivity name="Notify shipment“
          businessTransaction="Notify of advance shipment"
          fromAuthorizedRole="buyer"
          toAuthorizedRole="seller"/>

     <Start toBusinessState="Create Order"/>

     <Transition
          fromBusinessState="Create Order"
          toBusinessState="Notify shipment"/>

     <Success fromBusinessState="Notify shipment"
               guardCondition="Success"/>

     <Failure fromBusinessState="Notify shipment"
               guardCondition="BusinessFailure"/>
</BinaryCollaboration>
```

ebXML Specification Schema



ebXML Business Process Specification Schema Overall Structure

ProcessSpecification (Documentation*, (Include* | DocumentSpecification* |
ProcessSpecification* | Package | BinaryCollaboration | BusinessTransaction |
MultiPartyCollaboration)*)

- Documentation()
- Include(Documentation*)
- DocumentSpecification(Documentation*, BusinessDocument*)
  - BusinessDocument(Documentation*)
    - Package(Documentation*, (Package | BinaryCollaboration | BusinessTransaction |
      MultiPartyCollaboration)*)
  - BinaryCollaboration(Documentation*, AuthorizedRole, AuthorizedRole, (Documentation* | Start |
    Transition | Success | Failure | BusinessTransactionActivity | CollaborationActivity
    | Fork | Join)*)
    - AuthorizedRole(Documentation*)
    - Start(Documentation*)
    - Transition(Documentation*)
    - Success(Documentation*)
    - Failure(Documentation*)
    - Fork(Documentation*)
    - Join(Documentation*)
    - BusinessTransactionActivity(Documentation*)
    - CollaborationActivity(Documentation*)
  - BusinessTransaction(Documentation*, RequestingBusinessActivity, RespondingBusinessActivity)
    - RequestingBusinessActivity(Documentation*, DocumentEnvelope)
    - RespondingBusinessActivity(Documentation*, DocumentEnvelope*)
  - MultiPartyCollaboration(Documentation*, BusinessPartnerRole*)
    - BusinessPartnerRole(Documentation*, Performs*, Transition*)
      - Performs(Documentation*)
      - Transition(Documentation*)

ebXML CPP & CPA

Collaboration Protocol Profile (CPP) describes party's IT capabilities:

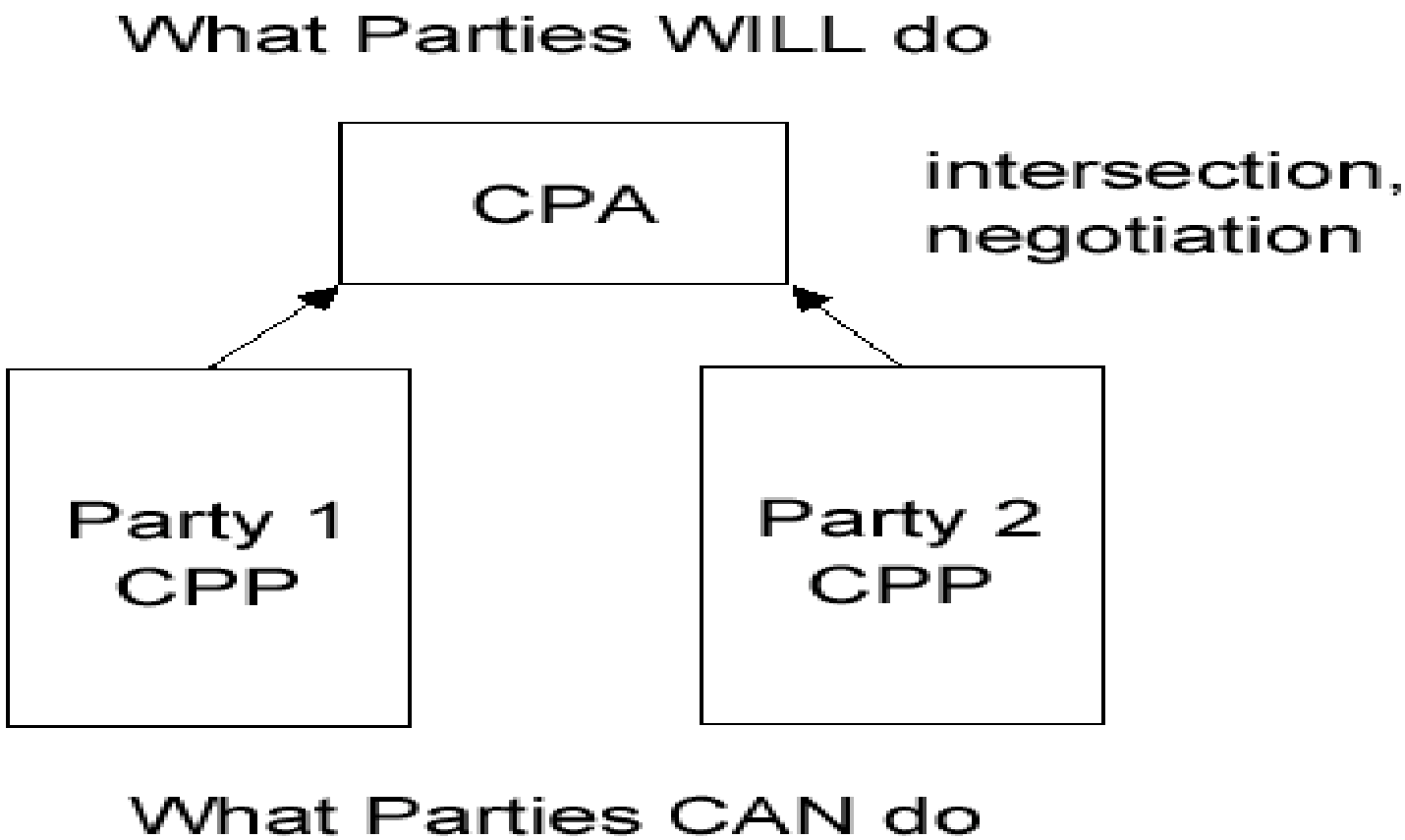
- Communication protocols
- Security requirements
- Business process it supports

Collaboration Protocol Agreement (CPA) describes:

- Agreed IT capabilities
- Business process to be performed

CPA is intersection of two parties' CPPs plus results of negotiating variable parameters.

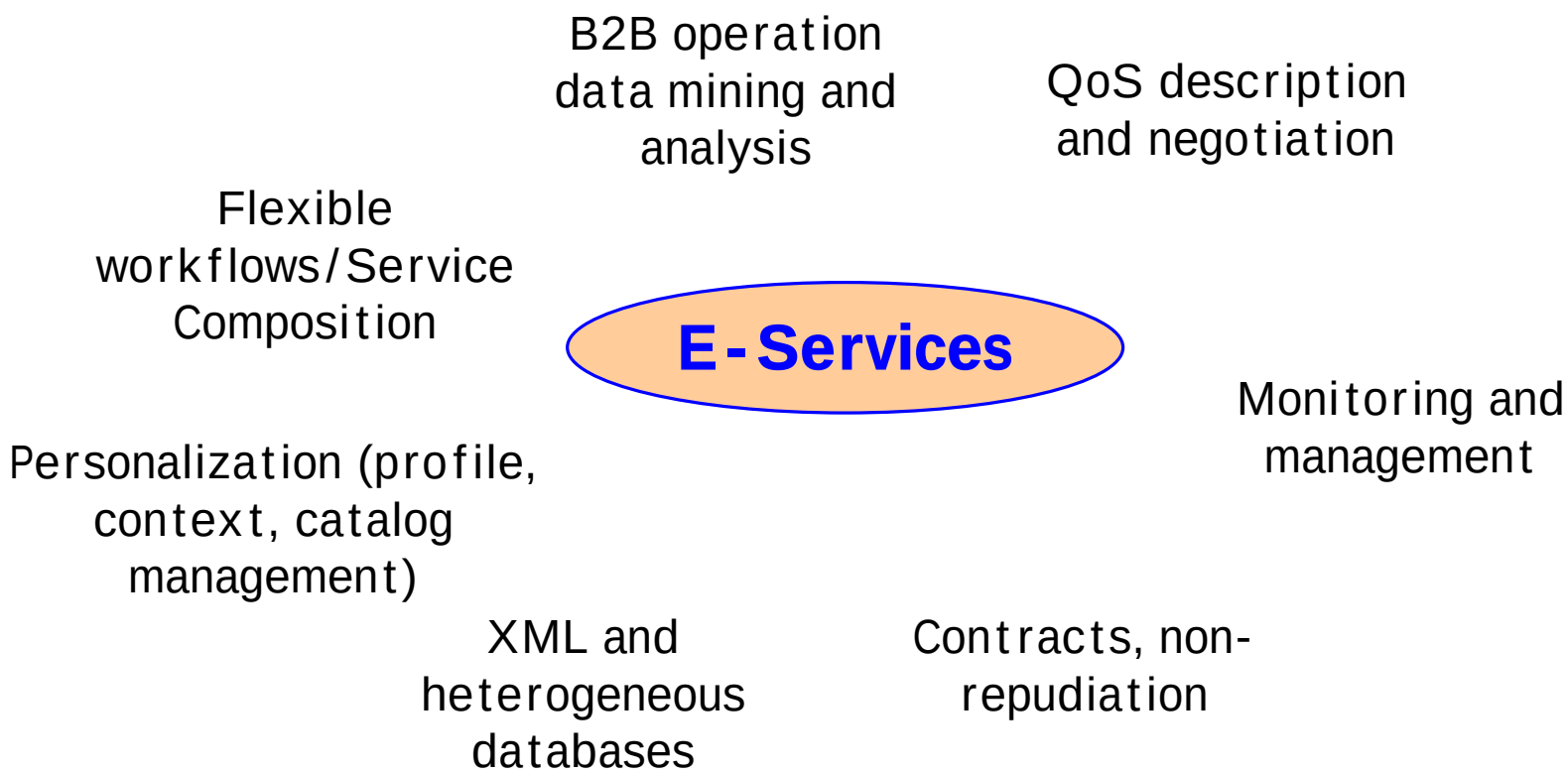
ebXML CPP & CPA



CPP Structure

```
<CollaborationProtocolProfile id = "id"
  various namespace attributes...>
  <Party partyId = "N01">
      ...(Refer next slide)
  </Party>
  <!--CollaborationProtocol:  one or more-->
  <CollaborationProtocol version = "1.0" id = "N07"
    xlink:type = "locator"
    xlink:href = "http://www.ebxml.org/services/purchasing.xml">
     Buy and Sell
  </CollaborationProtocol>
  <ds:Signature>any combination of text and elements
  </ds:Signature>
</CollaborationProtocolProfile>
```

Some Open Research Issues



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