

4. Concepts and Technologies for B2C, B2E, and B2B Transaction

4.4 Exchanging Information within Open Business Communities

4.4.1 “Pre-Internet” B2B standards: EDI, Interactive EDI, Universal EDI, OpenEDI

4.5 Technologies for Internet-based B2C or B2B Commerce

4.5.1 ebXML, BizTalk, RosettaNet

4.5.2 WebServices, SOAP, UDDI, WSDL

Electronic Data Interchange (EDI) (1)

The **Electronic Data Interchange (EDI)** standard existed before the Internet existed and was used to conduct business. It allows for exchange of electronic business documents. It standardizes electronic messages and the content semantics:

- ❑ EDI itself exists as two disparate *de-jure standards*: EDIFACT (Europe) and X12 (USA).
- ❑ *De-facto standards* were introduced by „big players“ ⇒ many different formats exist.

EDI messages were primarily specified for usage on Telex machines ⇒ their format is severely restricted, they may not contain binary data

Subsequent standards of EDI:

- ❑ Non-internet-based EDI Successors:
 - Open EDI, Universal EDI (OO-EDI), Interactive EDI
- ❑ Internet-based EDI Successors:
 - ebXML, WebServices.

Example

EDI (EDIFACT order)

UNH+0002771776+ORDERS:D:99A:UN:FI0084'
BGM+105+40063000277177602748497+9'
DTM+4:20000705:102'
DTM+2:20000706:102'
DTM+9:20000705:102'
NAD+BY+003709895955:100++TRADEKA OY'
NAD+SE+003702134547:100++OY HARTWALL AB'
NAD+CN+40063000::92++VALINTATALO
HERVANTA+LINDFORSINKATU 2+TAMPERE++33720'
LIN+1++6413600001584:EN'
IMD+F+8+:::HTW NOVELLE ORANGE LIME 1,5 L'
QTY+21:144'
LIN+2++6413600000280:EN'
IMD+F+8+-:::VICHY 0,33L/HARTWALL'
QTY+21:430'
UNS+S'
CNT+2:2'
UNT+17+0002771776'

Source: TIEKE (EDI standards
implementation guidelines
document)
(c) Paavo Kotinurmi 2001-2004 24.11.2004



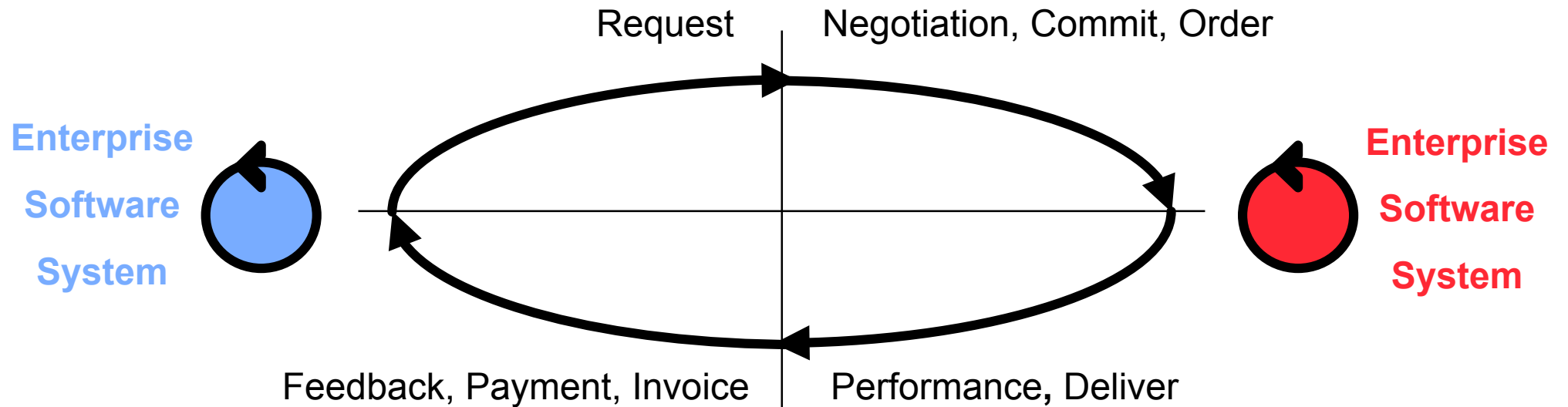
EDI

EDI explained

- EDI is a set of message formats that act as templates for purchase orders, invoices, payments, shipping manifests, and the like.
- They allow data to be moved around between companies while ensuring that it can be automatically read by all.
- EDI has nothing to say about how individual applications are built, only that they should export data in a particular format, and that they can expect to receive data in a particular format.

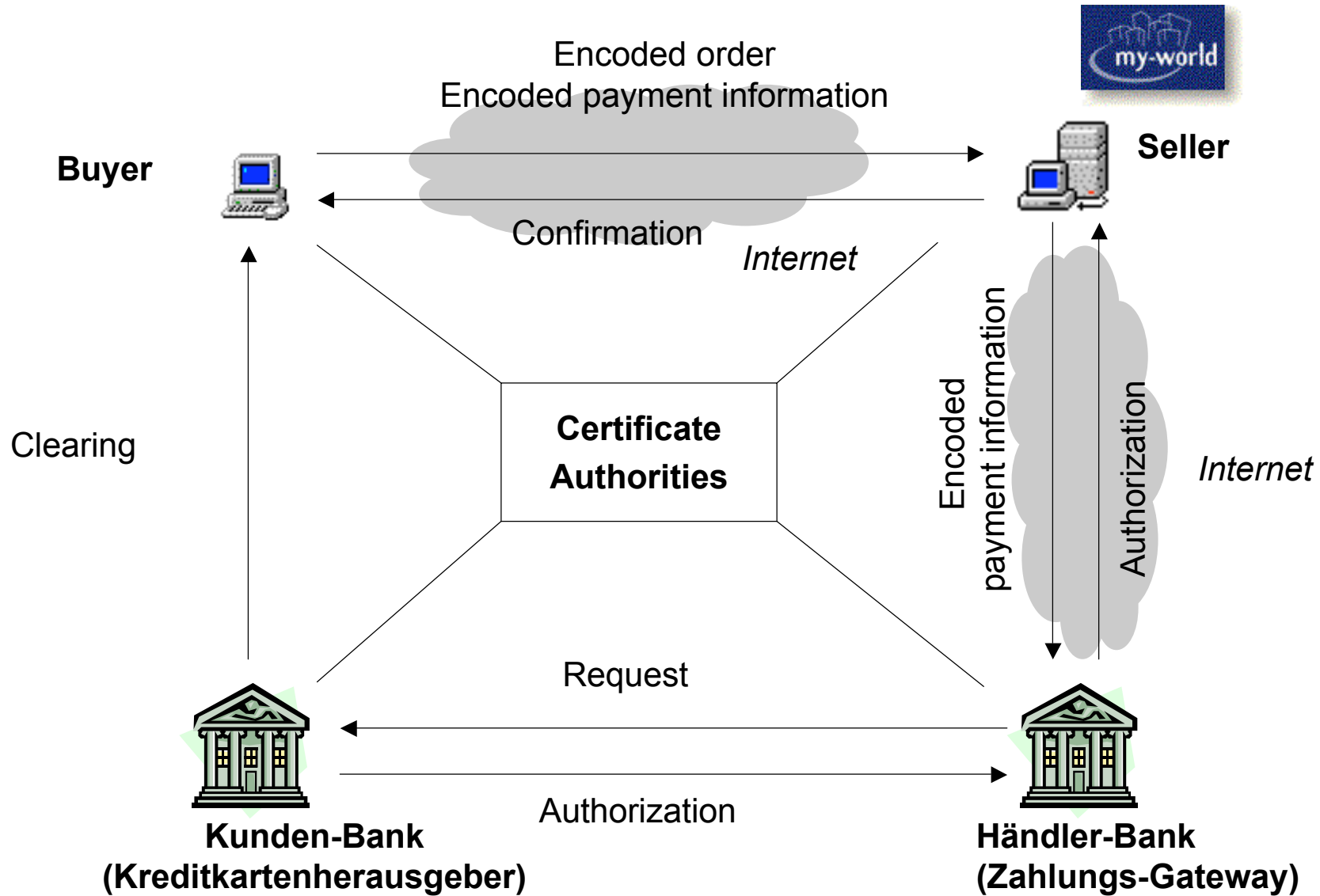


Example Scenario 1



- Order
 - Deliver
 - Invoice
 - Payment
- } handled by
EDI

Example Scenario 2



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XML / EDI & more \Rightarrow ebXML



Purpose

Original purpose: Realize EDI using XML documents as EDI messages.

Motivation: XML for data and document modeling:

- Portable exchange format for data of different application domains.
- Storage of semi-structured data in (XML-)databases. Mixes describing data (meta data) and data itself.

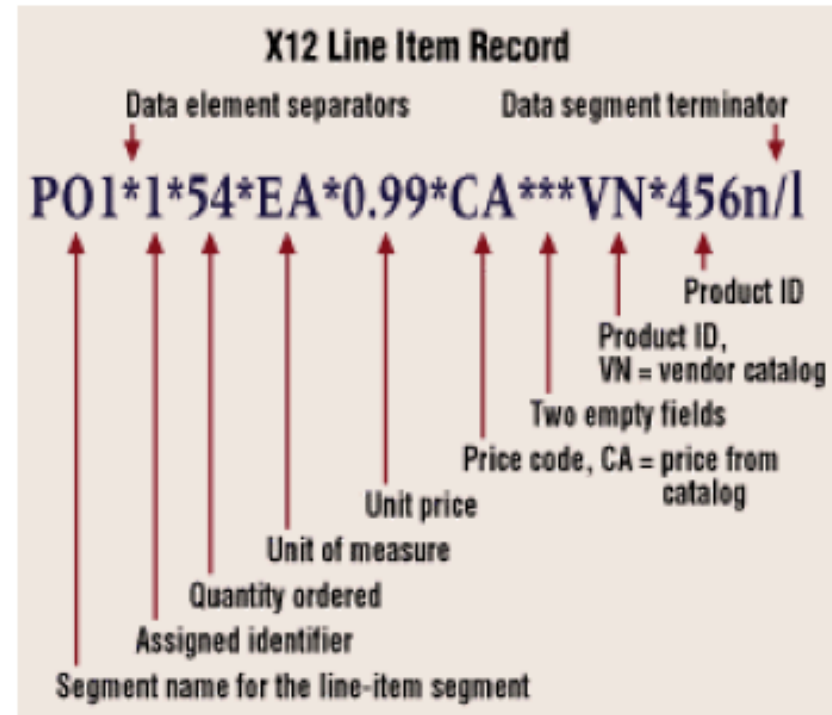
XML / EDI has surfaced as the **ebXML** standard. ebXML has only few connections to the original EDI standard:

- Open standard platform (unlike EDI)
- Business service modeling is done in UML (design) and XML (representation)

Example

XML vs. EDI example

```
<po1>
  <ass.Id>1</ass.id>
  <Q.Ordered>54</Q.Ordered>
  <Unit.M>EA</Unit.M>
  <Unit.P>0.99</Unit.P>
  <Price.C>CA</Price.C>
  <Prod.ID.C>VN</Prod.ID.C>
  <Prod.ID>456</Prod.ID>
</po1>
```



Source: Drummond and Spearman, 1999.

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ebXML (1)

Purpose of ebXML (Electronic Business eXtensible Markup Language)

- ❑ The **United Nations body for Trade Facilitation and Electronic Business (UN/CEFACT)** and the **Organization for the Advancement of Structured Information Standards (OASIS)** have initiated a project to standardize XML business specifications.
- ❑ UN/CEFACT and OASIS have established the Electronic Business XML Initiative to develop a **technical framework** that will enable XML to be utilized in a consistent manner for the exchange of **all electronic business data**.
 - ebXML is an open architecture, not a standard
- ❑ **Lower the barrier of entry** to electronic business in order to **facilitate trade**, particularly with respect to **small- and medium-sized enterprises (SMEs)** and **developing nations**.

Technically:

- ❑ Provide an open XML-based infrastructure enabling the global use of electronic business information in an interoperable, secure, and consistent manner by all parties.

ebXML (2)

ebXML values

- Provides a globally developed open XML-based standard built on a rich heritage of electronic business experience.
- Creates a Single Global Electronic Market
- Enables all parties irrespective of size to engage in Internet-based electronic business.
- Provides for plug and play shrink-wrapped solutions.
- Enables parties to complement and extend current ECommerce / EDI investment and expand electronic business to new and existing trading partners.
- Facilitates convergence of current and emerging XML efforts.

Note:

- Proof-of-concept has been successfully done.
- Widely regarded as a strong successor-elect of EDI.



ebXML Architecture

Anne Thomas Manes

Sun Microsystems

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ebXML Vision

A global electronic market place where enterprises of any size, anywhere can:

- ❑ Find each other electronically
- ❑ And conduct business
 - Using XML messages
 - According to standard business process sequences
 - With clear business semantics
 - According to standard or mutually agreed trading partner protocol agreements
 - Using off the shelf purchased business applications



B2B Collaboration

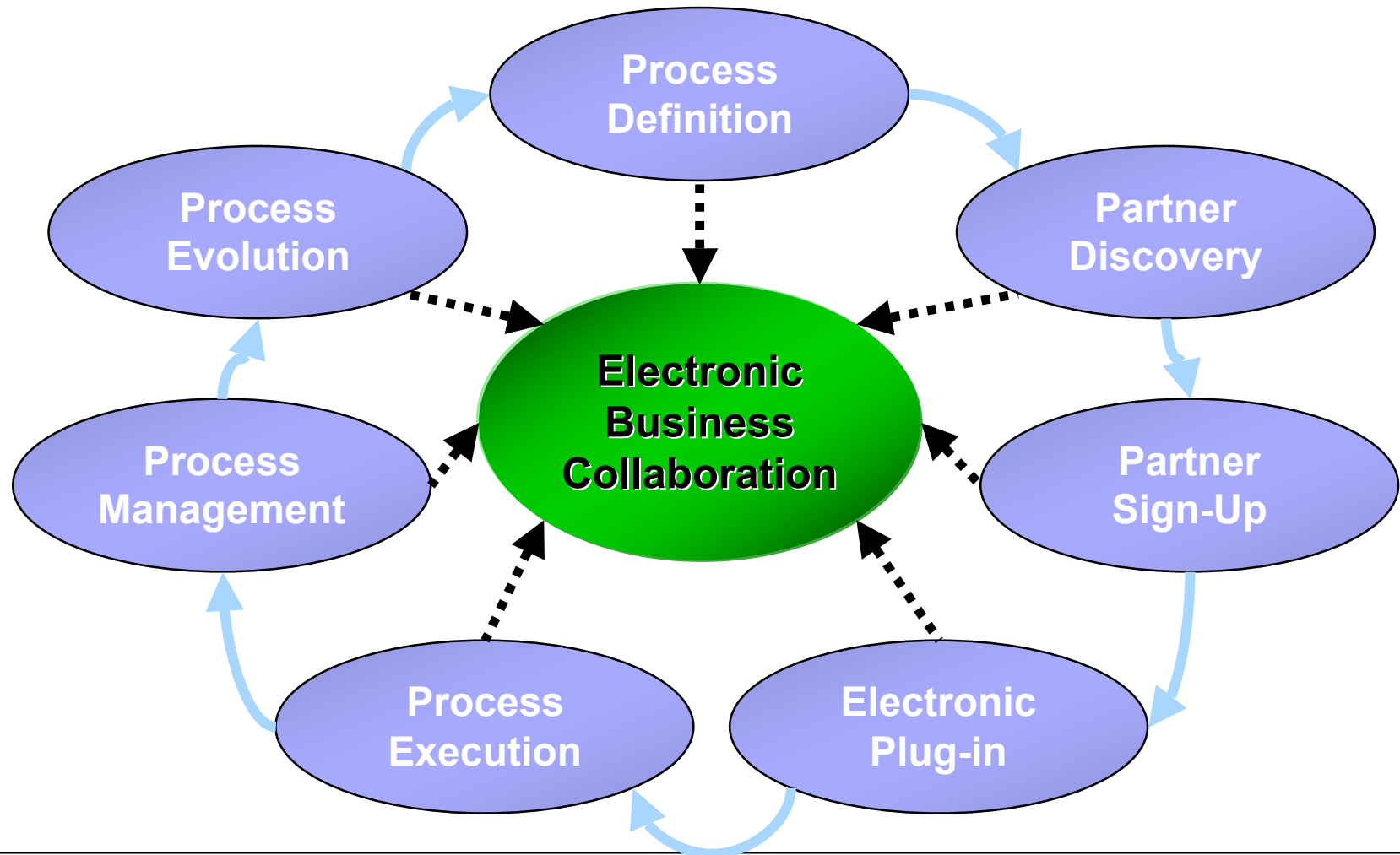
B2B collaboration requires more than just an XML protocol and a service registry

You have to deal with

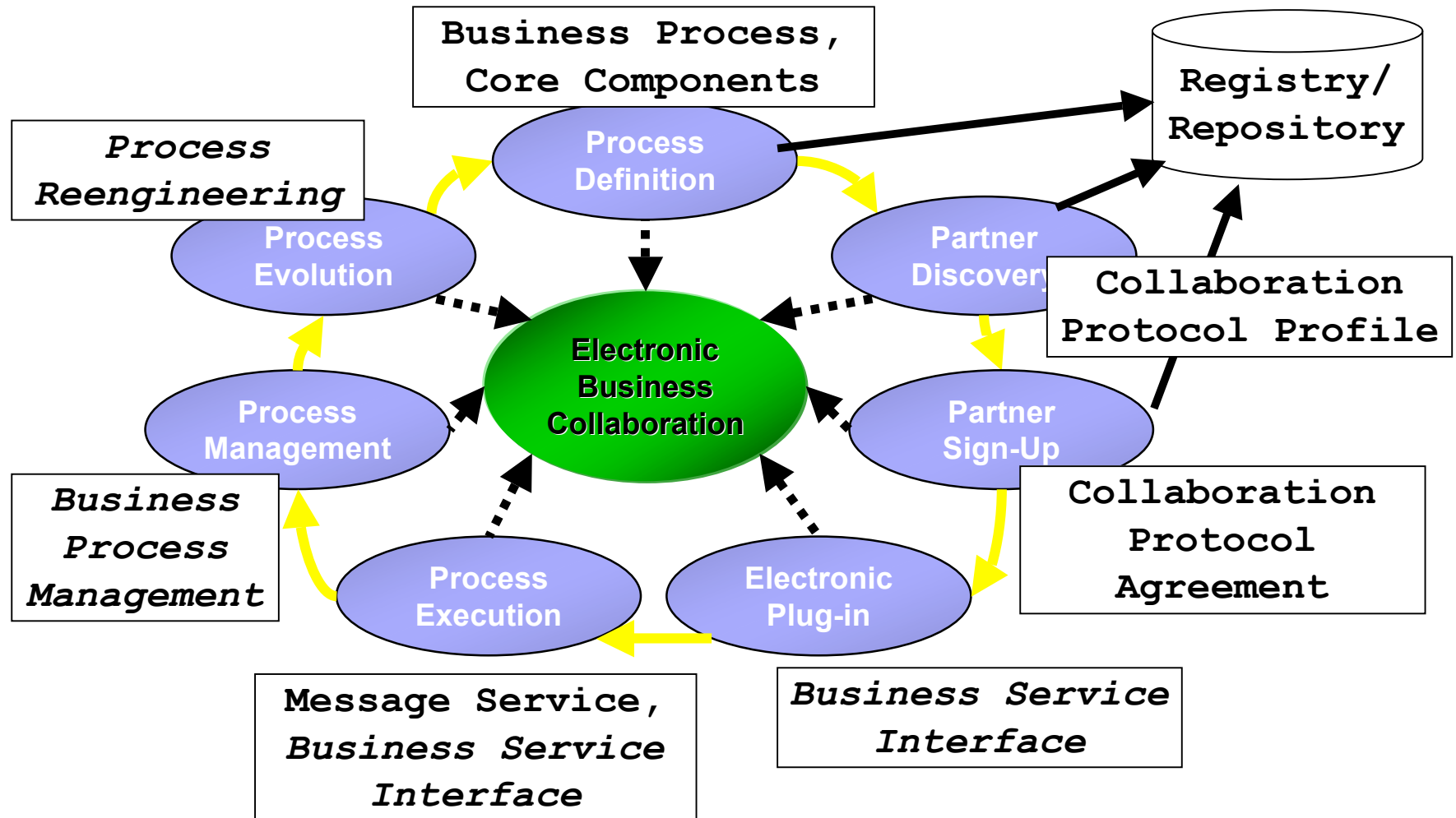
- Business semantics
- Negotiating terms and conditions
- Interoperability
- Security and Privacy
- Reliability

ebXML provides concrete specifications to enable dynamic B2B collaborations

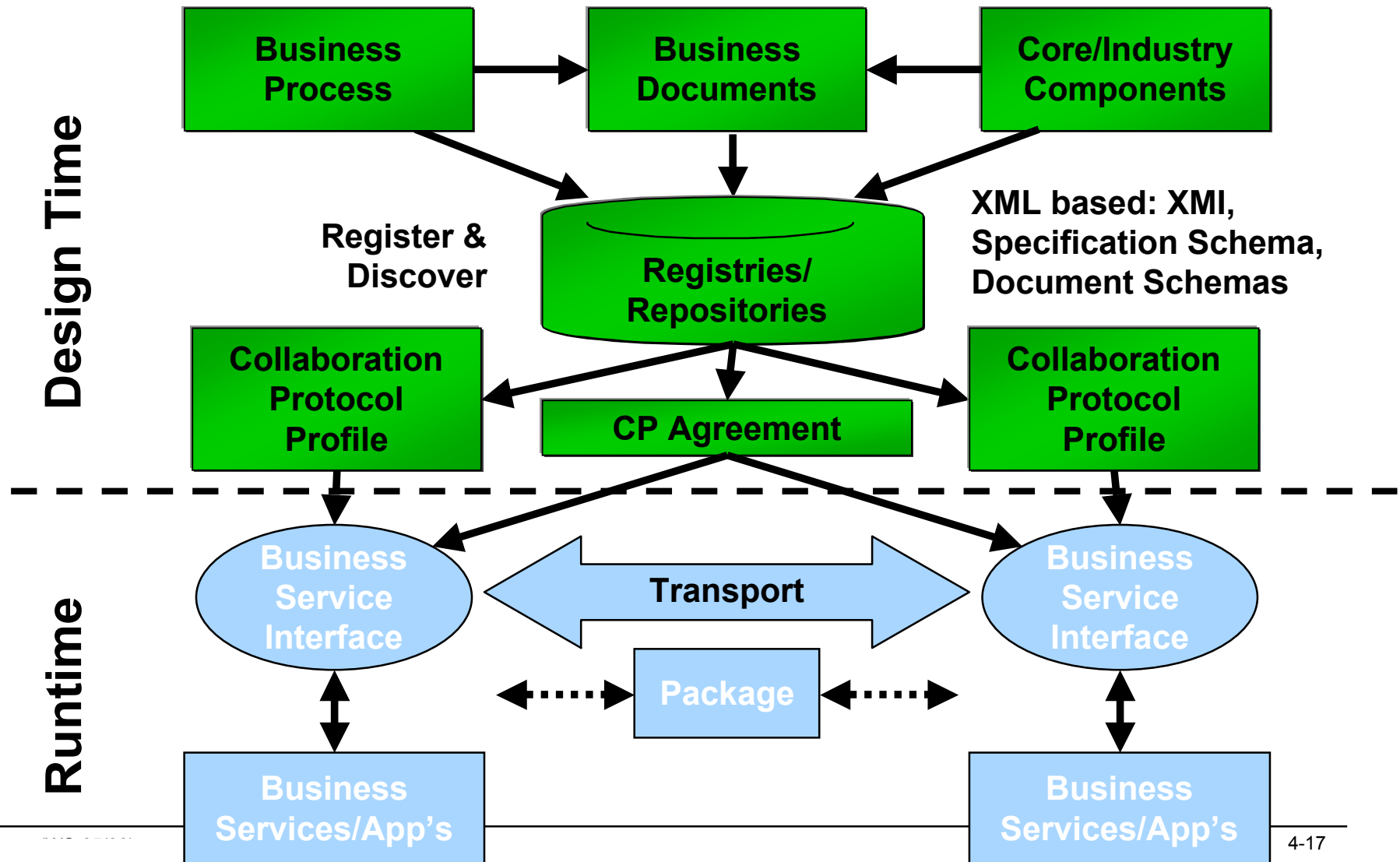
B2B Collaboration Process



ebXML Specifications

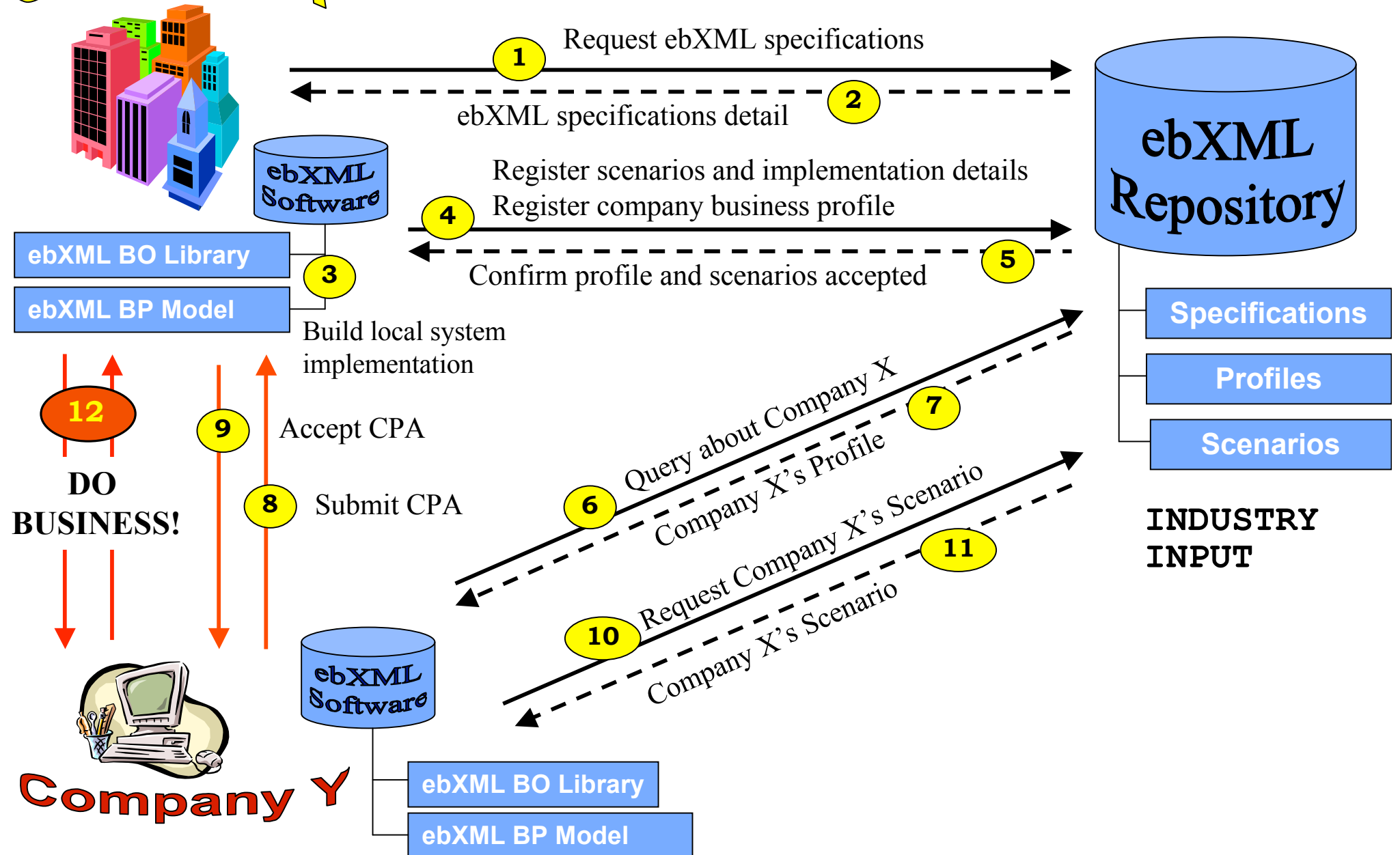


ebXML Architecture



Usage Example

Company X





Company Profile

Collaboration Protocol Profile

- ❑ Defined using ebXML Specification Schema
- ❑ Concrete specification of your ebusiness offerings
 - Business scenarios you support
 - Service interfaces you implement
 - Document formats exchanged
 - Technical requirements/options (protocols, security, reliability)

Composed of

- ❑ Business process models
- ❑ Information models
- ❑ Context rules



Business Scenarios

Often defined by Industry Groups

- Standard business scenarios remove the need for prior agreements among trading partners

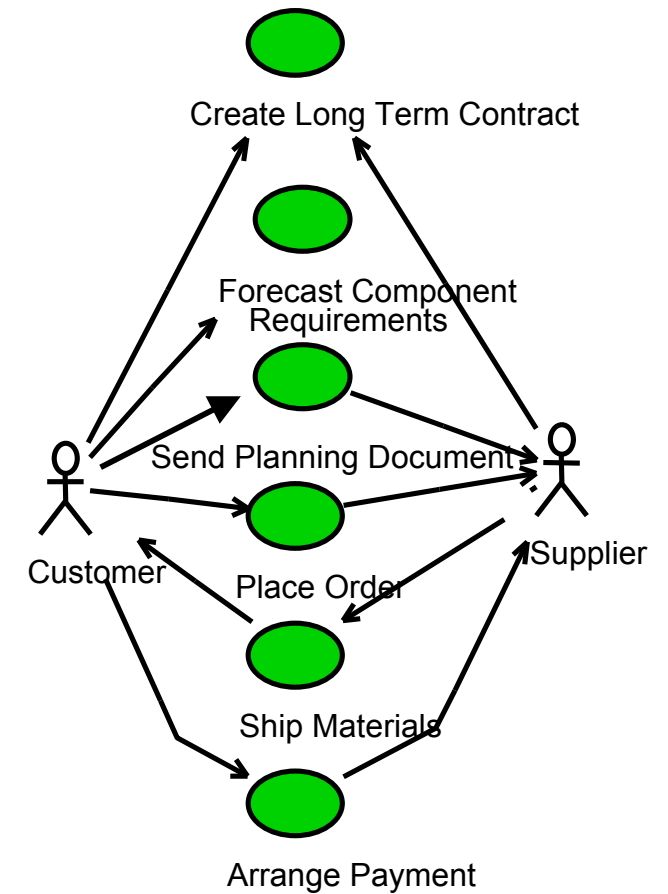
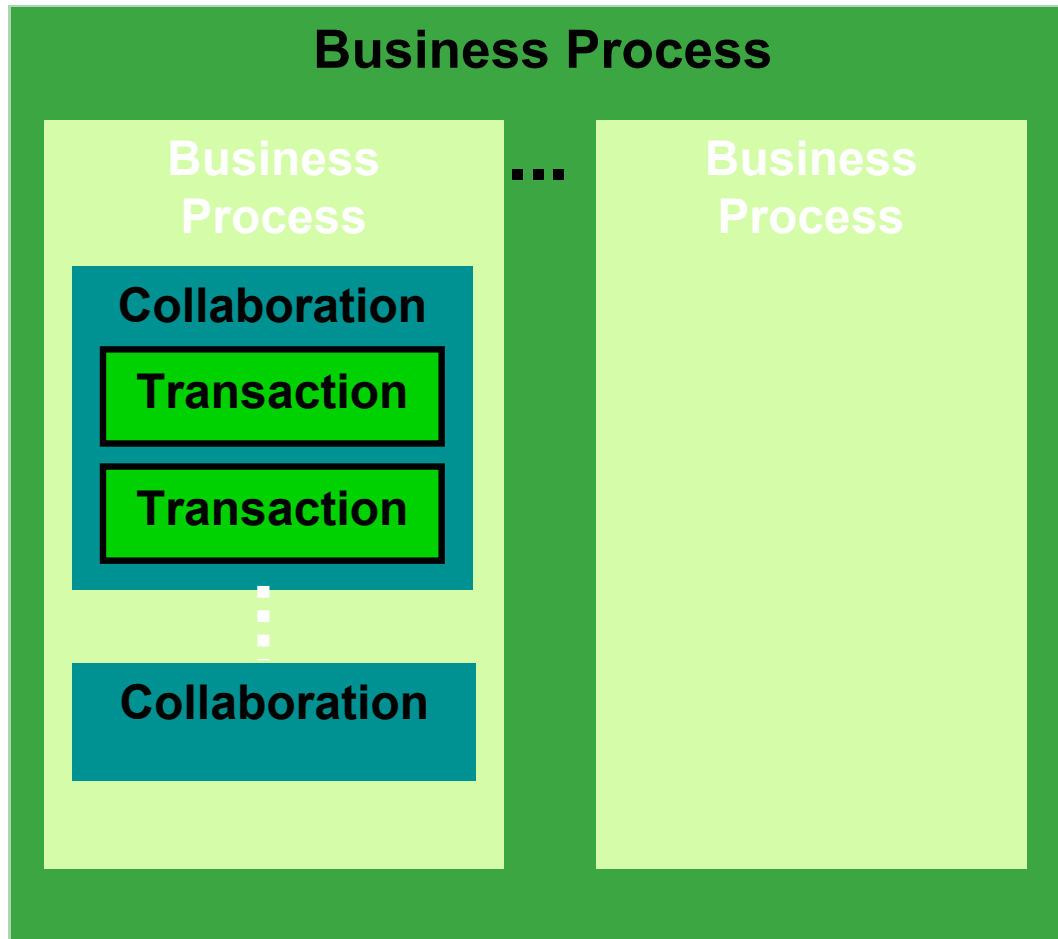
Business Process Model

- Interactions between parties
- Sequencing of interactions
- Documents exchanged in each interaction

Information Model

- Document definition
- Context definition
- Context rules

Business Process



Resources



ebXML Participation & Mailing Lists

- Open to everyone
- <http://www.ebxml.org/participate.htm>

ebXML Specifications

- http://www.ebxml.org/specdrafts/approved_specs.htm

BizTalk: Goals

BizTalk is Microsoft's platform for

- ❑ business partner integration as well as
- ❑ enterprise applications integration (EAI) (not covered here).

Goals for integrating business partners by

- ❑ Designing and implementing dynamic business processes (B2B – electronic document exchange processes)
- ❑ Integrating legacy systems and enterprise applications into business processes (Enterprise Application Integration, EAI).
- ❑ Open Standards: BizTalk relies on open standards and specifications (SOAP / XML, HTTP, SMTP).

Purpose: Relate interorganizational messaging technologies (messaging systems, emailing, XML messaging) with a company's applications and legacy systems.

[MS01]

BizTalk: Technical Aspects

Technical aspects:

- ❑ BizTalk server tracks data and documents exchanged in business processes.
- ❑ Document type definition (schema) transformation support for mapping business documents of different companies.
- ❑ BizTalk provides a programming framework (2.0) for (legacy) system integration.

Document exchange formats:

- ❑ EDI (both standard ANSI X12 and EDIFACT)
- ❑ HTTP / HTTPS (web-based)
- ❑ SMTP (mail-based)
- ❑ File-transfer
- ❑ Fax – only outbound

Application / Legacy System Integration:

- ❑ Integration via *Open Binding Architecture*: Adapters connect BizTalk System to applications & legacy systems.

[MS01]

RosettaNet.org

RosettaNet

- RosettaNet is a non-profit organization that directs business process and supply chain standardization. It is especially strong in the electronics industry even though it is not limiting itself to any particular industry.
- Over 500 members (HP, Cisco, Intel, Microsoft, Nokia, Sun...)
 - Electronic Components (EC),
 - Information Technology (IT),
 - Semiconductor Manufacturing (SM),
 - Solution Provider (SP)
 - Telecommunication (TC) (Quite recent)
 - Logistics (LG) (Quite recent)



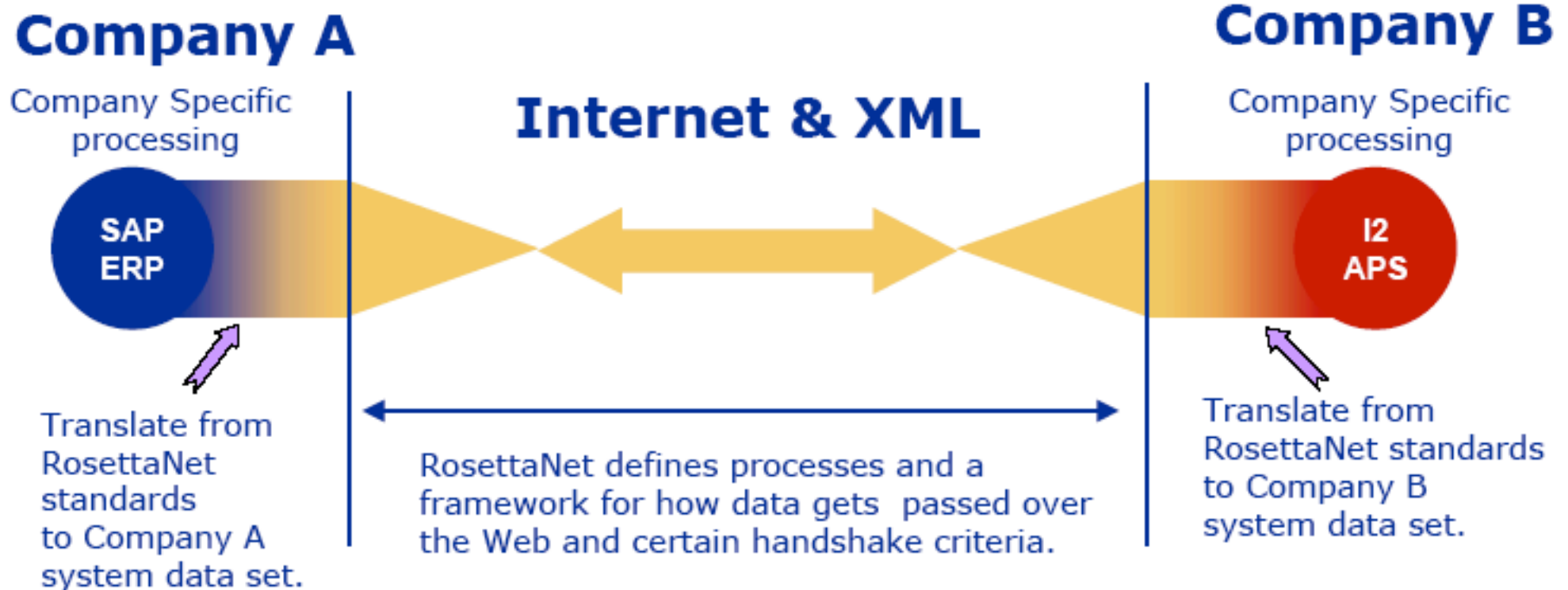
Purpose

RosettaNet

- Standardizes inter-company “public” processes (PIPs)
- The related messages (DTD + Message guidelines) = Business documents
- Standard messaging framework (RNIF).
- Defines dictionaries (RNTD and RNBD) and codes (GTIN and DUNS)
- Trading partner agreement (TPA)
- RN technical dictionary only really industry specific part



Communication based on Internet and XML



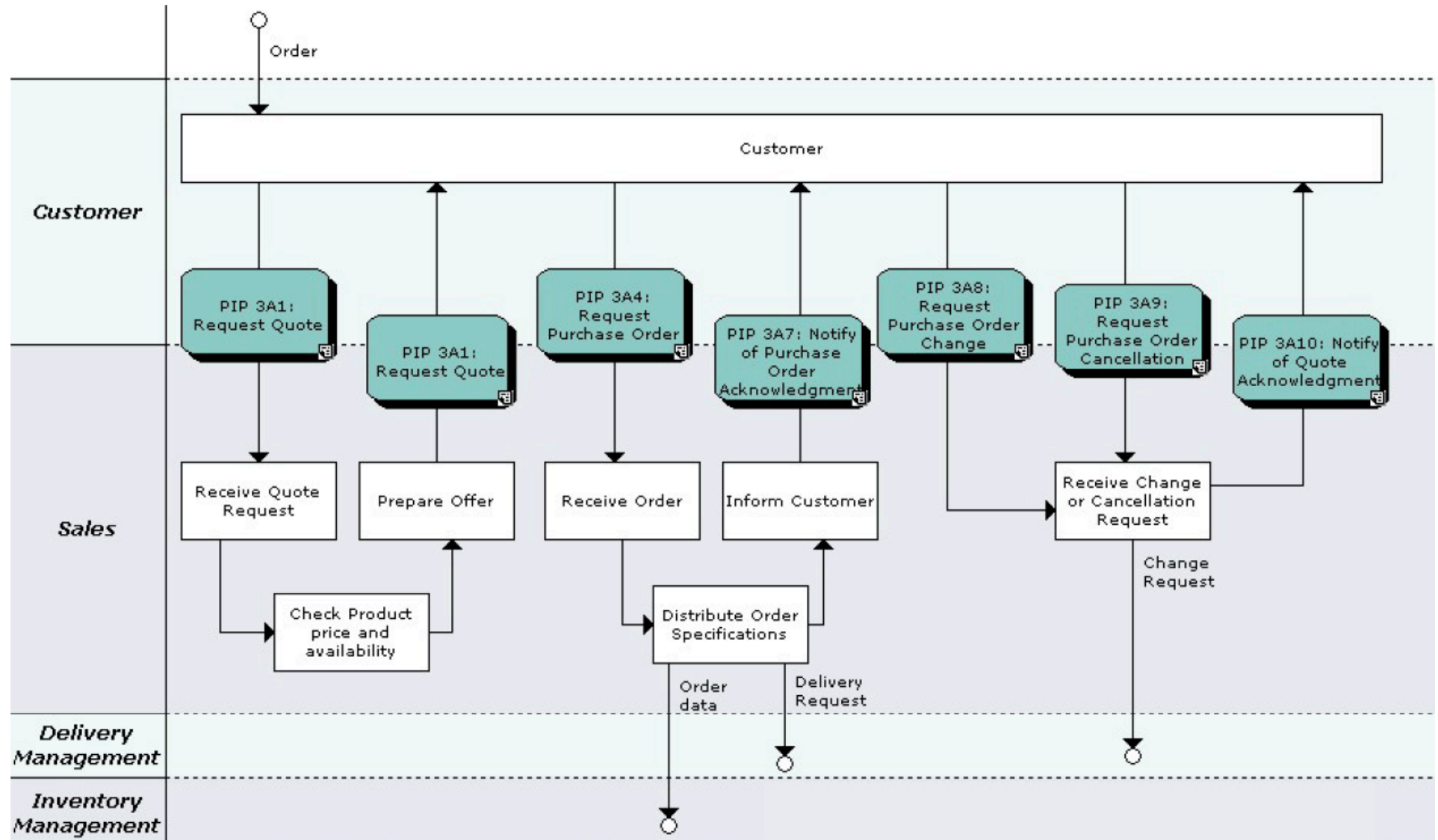
source: RosettaNet



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Order Processing in Generic Company



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WebService: Definitions

WebServices are ...

... self-contained, modular applications that can be described, published, located, and invoked over a network, generally, the Web. [IBM]

... a type of service that can be shared by and used as components of distributed Web-based applications [BEA].

... programmable application logic accessible using standard Internet protocols [Microsoft].

WebServices are **online services** (e.g. flight reservation service, hotel booking service, etc.) that are accessed over the Internet via **method invocation** and not by requesting HTML pages. WebServices can technically be understood as remote procedure calls (RPC). They use SOAP messages for invocation, parameter passing and returning results. As a result, they provide information but no visualization.

WebServices can be used by other WebServices or by human users. As WebServices do not provide presentation of content, the content must be rendered (visualized) for the human user.

Benefits and Shortcomings of WebServices

Benefits of WebServices

- ❑ Uses open and widely adopted standards
- ❑ Platform- and language-independent
- ❑ Broad support by major players (IBM, Microsoft, Sun, ...) and agreement about new, upcoming standards
- ❑ “WebServices are a necessity”:

Dynamic B2B integration requires service-to-service communication.

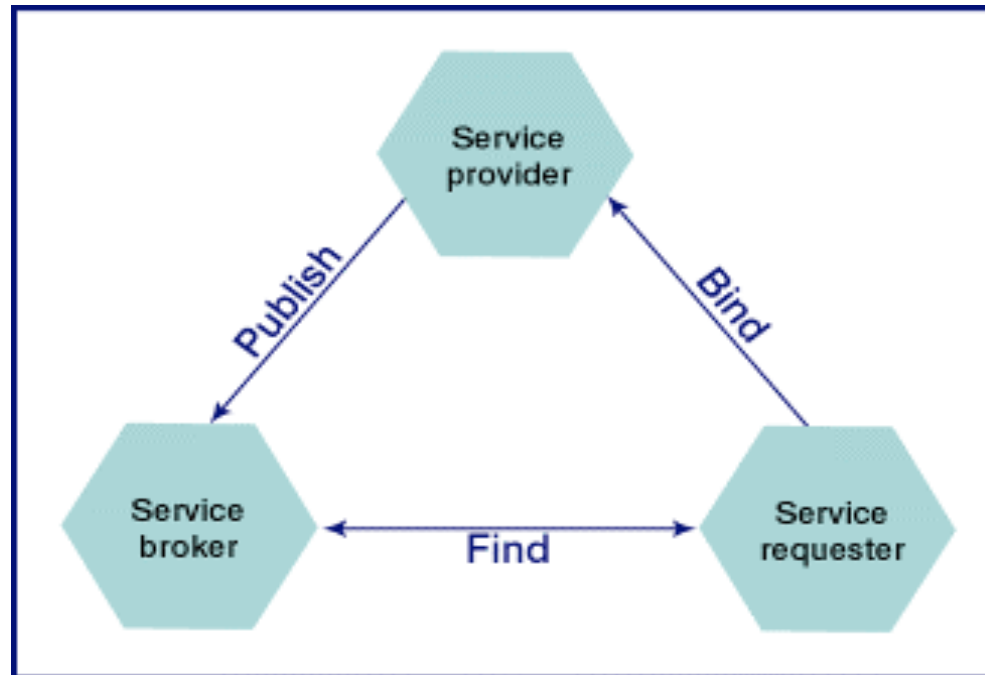
Business Application Integration (BAI) will be simplified

Shortcomings:

- ❑ General problem: How to describe the *semantics* of services (WebServices do not solve this problem either)
- ❑ Presentation of service must be provided separately.

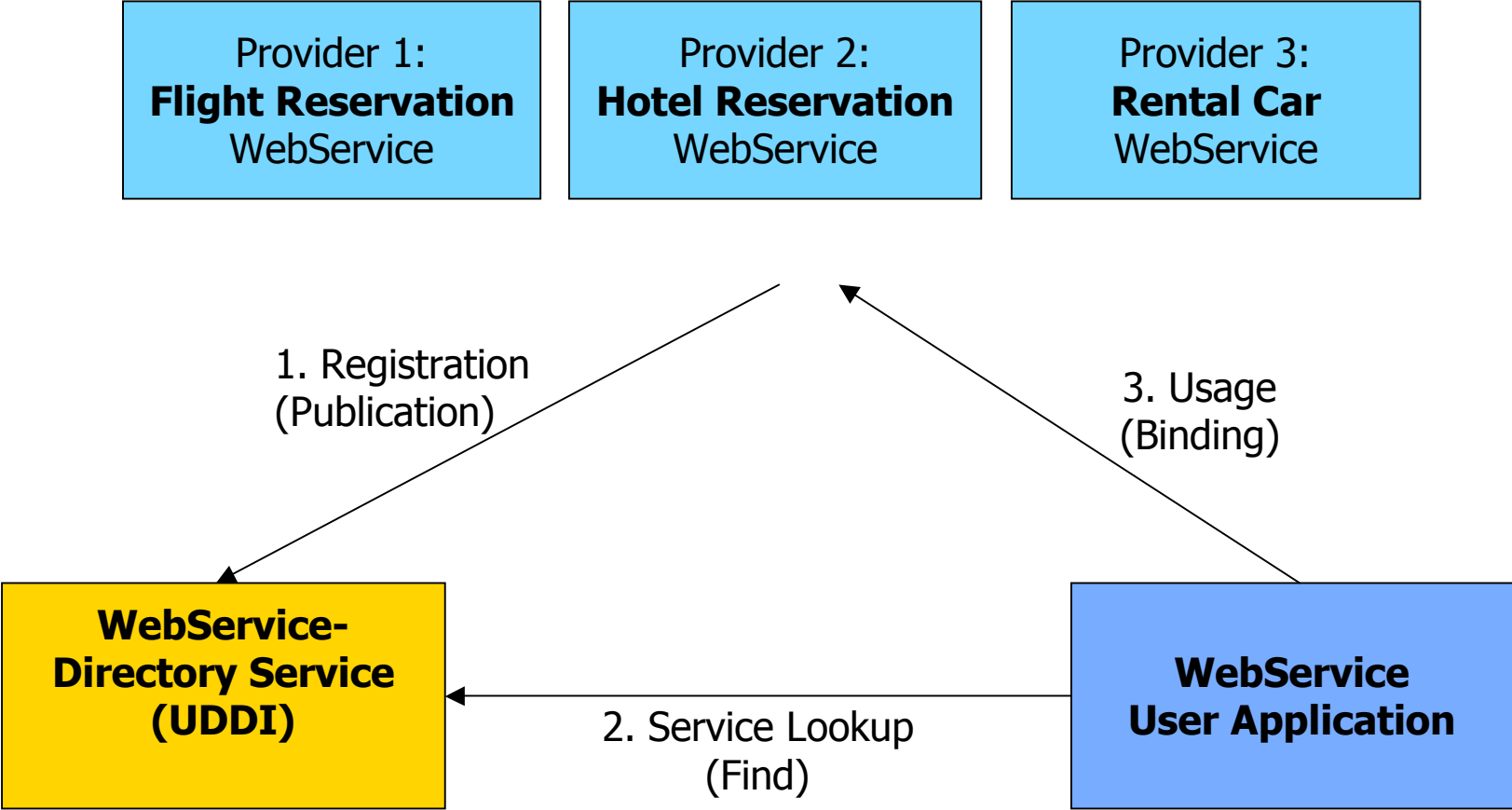
WebServices Technologies

1. Description → WSDL (XML-based Web Services Description Language)
2. Publishing → UDDI (see next sections)
3. Lookup → UDDI (- "" -)
4. Invocation → SOAP (- "" -)



Quelle: Dan Gisolfi (IBM) – Web Services Architect Part 1

WebService: Example



Simple Object Access Protocol (SOAP)

The **Simple Object Access Protocol (SOAP)** is an XML / HTTP based protocol for **accessing services, objects and servers in a platform-independent manner.**

- ❑ developed from the idea to create an XML-based RPC (remote procedure call) mechanism
- ❑ mainly driven by Microsoft and IBM → large support base
- ❑ platform- and programming language independent
- ❑ asynchronous communication is possible
- ❑ standard transport protocol is HTTP.

SOAP is **NOT** a replacement for CORBA / DCOM, it is simply a wrapper technology to make services more accessible over the Internet

Spec: <http://www.w3.org/TR/SOAP/>

SOAP: Related, Existing Technologies

Existing distribution architectures and technologies include

- ❑ OMG CORBA, Microsoft DCOM, Java RMI, Unix-RPC, ...

But no single technology is used for dynamic and interorganizational service integration.

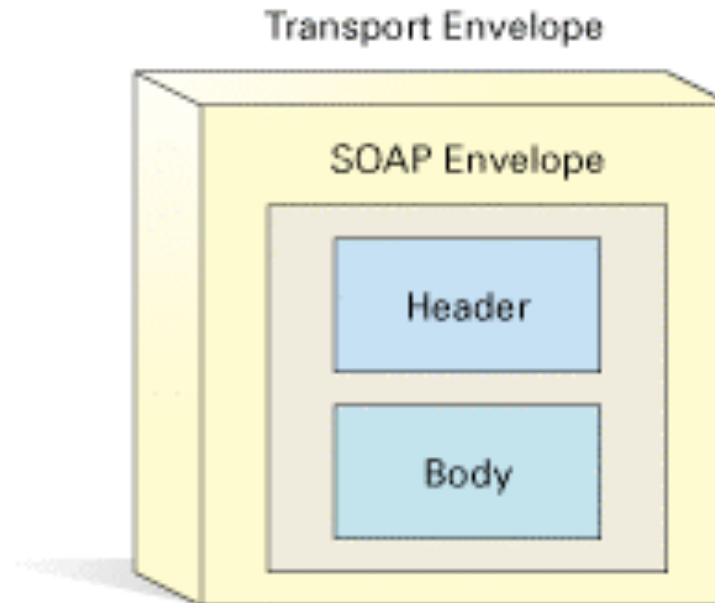
Some reasons:

- ❑ Unix-RPC: requires binary-compatible Unix systems on both sides
- ❑ CORBA: not widely adopted
- ❑ RMI: requires Java on both sides
- ❑ DCOM: requires Windows systems on both sides
- ❑ Firewall problems (packets are filtered by firewalls if using dynamic ports)

SOAP Message Structure

SOAP extends HTTP request / responses with

- ❑ SOAP-Header to identify that it's a SOAP message
- ❑ SOAP-Body containing an XML *payload*: the actual data to be transmitted



SOAP: Example Message: Stockquote

POST /StockQuote HTTP/1.1

Host: www.stockquoteserver.com

Content-Type: text/xml; charset="utf-8"

Content-Length: nnnn

<SOAP-ENV:Envelope

xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/"

SOAP-ENV:encodingStyle="http://schemas.xmlsoap.org/soap/encoding/">

<SOAP-ENV:Body>

<m:GetLastTradePrice xmlns:m="Service definition (namespace) URL">

<symbol>**SAP**</symbol>

</m:GetLastTradePrice>

</SOAP-ENV:Body>

</SOAP-ENV:Envelope>

Lookup Services: UDDI

The **Universal Description, Discovery and Integration** (UDDI) project aims at creating a platform-independent, open framework for

- ❑ describing services
- ❑ discovering businesses and
- ❑ integrating business services using the Internet,

as well as an

- ❑ operational registry (i.e., naming service) [UDDI02].

UDDI uses SOAP as protocol.

A **UDDI node** is a global directory service for companies and web services that companies provide.

Currently, there exist some public UDDI nodes at IBM and Microsoft, HP, etc.

See: <http://www.uddi.org>

UDDI (2)

Content types of UDDI nodes:

- ❑ **White Pages:** General information about companies:
name, address, contact, etc.
- ❑ **Yellow Pages:** Classification of companies
Based on existing, non-electronic standards (example: North American Industry Classification System, NAICS)
- ❑ **Green Pages:** Technical information about WebServices provided by a company.
WebServices will be explained in 6.3.4.

WSDL

WSDL: WebServices Description Language

WSDL evolved from

- ❑ IBM's Network Accessible Service Specification Language (NASSL) and
- ❑ Microsoft's Service Description Language (SDL).

It is an XML-based description of service operations and message formats for these operations.

It contains

- ❑ Supported operations,
- ❑ Datatype definitions (parameters and result types),
- ❑ Message definitions,
- ❑ Protocol and data format descriptions.

Protocol bindings for SOAP, HTTP GET and POST and MIME types are defined in the standard.

Spec: <http://www.w3.org/TR/wSDL>

WSDL Example

```
<message name="OrderMsg">
  <part name="productName" type="xsd:string" />
  <part name="quantity" type="xsd:integer" />
</message>

<portType name="procurementPortType">
  <operation name="orderGoods">
    <input message="OrderMsg"/>
  </operation>
</portType>

<binding name="ProcurementSoapBinding"
  type="procurementPortType">
  <soap:binding transport="http://schemas.xmlsoap.org/soap/http"/>
  <operation name="OrderGoods">
    <soap:operation soapAction="http://example.com/orderGoods"/>
    <input> <soap:body .../> </input>
  </operation>
</binding>

<service name="ProcurementService">
  <port name="ProcurementPort" binding="ProcurementSoapBinding">
    <soap:address location="http://example.com/procurement" />
  </port>
</service>
```

WSDL Example Explanation

types: Specifies all the data types, either predefined or user-provided, that are used in the messages sent between the server and client.

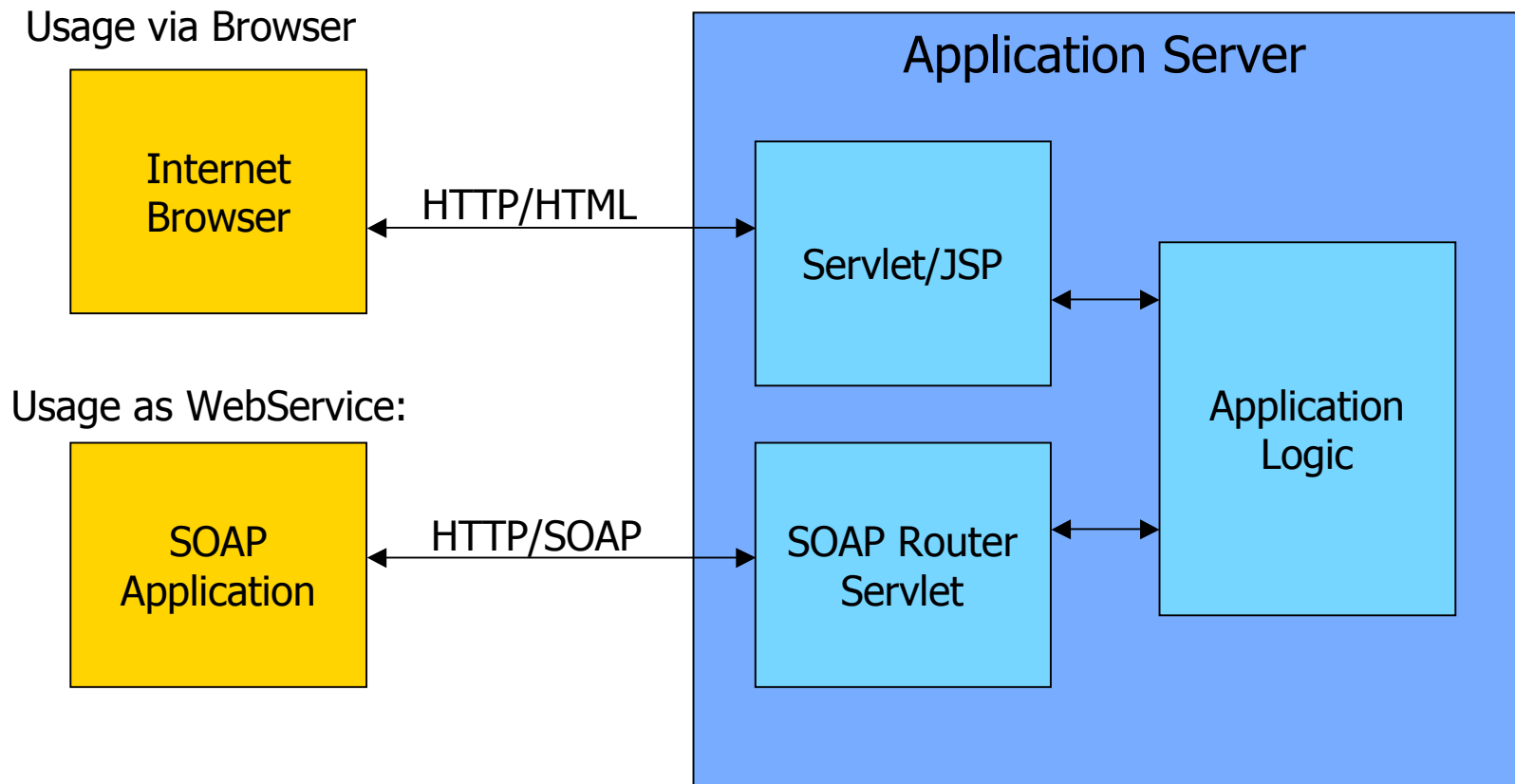
message: Describes a one-way message, may it be a request or response to a request message.

portType: Combines multiple message elements to one one-way or round-trip operation (for instance for a request/response scheme commonly used in SOAP services).

binding: Specifies how the service will be implemented 'on the wire', meaning it gives details on how messages should be transported over the Internet. They can be sent via HTTP, using either the GET or POST method, or SOAP (which itself again can be configured to work over HTTP, or e.g., SMTP).

service: Defines the address for invoking the service, usually a URL where a SOAP service is deployed at.

Combination of WebService and HTML Frontend



Extending WebServices to Business WebServices

Simple WebServices:

- Point-to-point connections (binary conversations)
- No transactions needed
- No / simple security measures
- Technologies: SOAP, WSDL, UDDI

Business WebServices:

- Can involve several business partners (multi-party business processes)
- Complex workflows (control-flow and information-flow, events, triggers, exceptions)
- Long-term transactions
- Security is required

➔ WebServices must be extended