XML as the Foundation for e-Marketplaces

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Yale CPSC 155b: e-Commerce

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Bob's Mini-Biography

- **Stanford BA, Wang Inst. MS, UCSD Ph.D.**
- **20+ years of R&D and consulting experience in text processing, user interface design, online publishing, electronic commerce**
  - **Bell Labs**
  - **CMU Software Engineering Institute**
- **Founder or co-founder of three companies**
  - **3rd one was Veo Systems:**
    - **pioneered XML in e-commerce, acquired by Commerce One in January 1999**
- **At Commerce One, (formerly) responsible for XML architecture / standards / interoperability: "Document Engineering"**

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Outline

- **Business Model and Technology Co-evolution for e-commerce**
- **The XML Revolution**
- **Electronic Marketplaces and Marketplace Networks**
- **Document Exchange Architecture**
- **The XML Common Business Library**
- **xCBL in the Global Trading Web**
- **Commerce standards as "Marketsite Onramps"**

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Business Model and Technology Co-Evolution for E-Commerce

Traditional Electronic Business

- **Traditional models for electronic business are based on long-term, point-to-point, and tightly coupled relationships**

- **Electronic Data Interchange (EDI) used since 1980s to automate routine transactions between established trading partners, especially for direct goods, supply chains**

- **But EDI syntax not programmer or Web-friendly**

- **Not well-suited for small businesses or more spontaneous, open market transactions like indirect procurement**

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Traditional Enterprise-Centric View for e-Business

Supply Chain

Customers

Enterprise

Indirect Procurement

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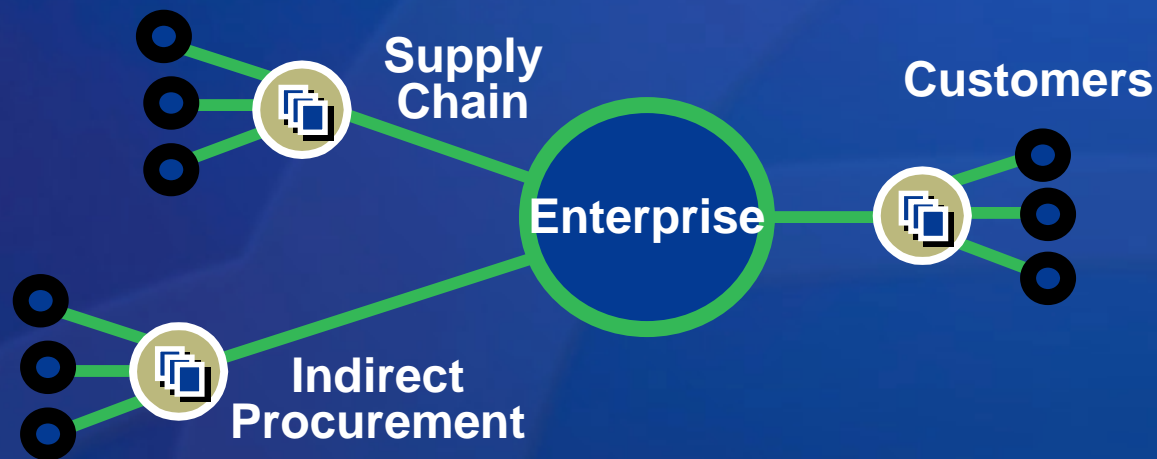
Sample EDI Message

```
20000305:102'DTM+158:20000305:102'DTM+159:20000722:102'NAD+SU+9876543
NY'NAD+MI+88835::92'GIS+37'NAD+ST+72681::92'LIN+++93235494:IN'PIA+1+0
04'REF+ON:XXX00004'QTY+79:6660:EA'DTM+51:19991225:102'DTM+52:20000304
91225:102'DTM+11:20000302:102'SCC+1++W:16'QTY+1:960:EA'DTM+158:200003
20000313:102'SCC+4++W:16'QTY+1:900:EA'DTM+158:20000320:102'QTY+1:900:
:1080:EA'DTM+158:20000403:102'QTY+1:1080:EA'DTM+158:20000410:102'QTY+
'QTY+1:630:EA'DTM+158:20000424:102'QTY+1:990:EA'DTM+158:20000501:102'
:102'QTY+1:810:EA'DTM+158:20000515:102'QTY+1:810:EA'DTM+158:20000522:
0529:102'QTY+1:810:EA'DTM+158:20000605:102'QTY+1:630:EA'DTM+158:20000
20000619:102'QTY+1:810:EA'DTM+158:20000626:102'QTY+1:810:EA'DTM+158:2
158:20000710:102'QTY+1:766:EA'DTM+158:20000717:102'SCC+2'QTY+3:12610:
:20000416:102'SCC+3'QTY+3:17485:EA'DTM+51:19991225:102'DTM+52:2000052
0:EA'UNT+73+770001'UNZ+1+77'UNB+UNOA:2+BFT:ZZ+CAI:ZZ+000305:2338+78++
```

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Business Trends

- **Relentless search for competitive advantage**

- **Ruthless efficiency necessary for survival**

- **Accelerating cycle times**

- **Focus shifting from administrative efficiency in the enterprise to winning in the marketplace**

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Business Inefficiencies

- **Lack of real time information for basic business decisions**

- **Inability to connect supply to demand increases costs and limits revenue**

- **Disparate technology across the value chain makes planning & collaboration slow and expensive**
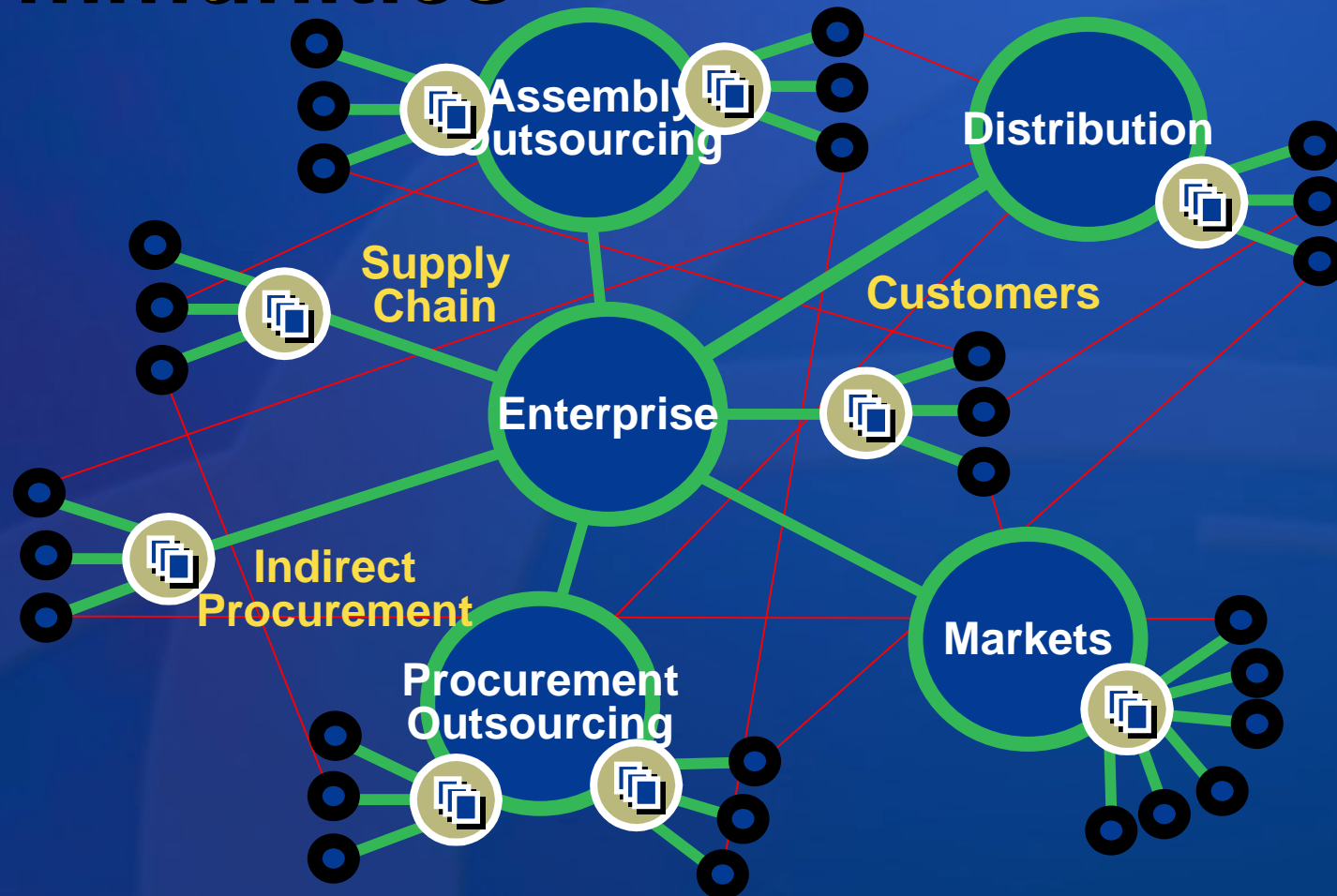
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Problem/Solution Mismatch

- **Current** problems **primarily result from poor visibility and collaboration with** external **commercial relationships**

- **Current** solutions **provide tools that focus on** internal **administrative and control processes of the enterprise**

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The Internet Was Supposed to Change Everything

The Internet will enable new business models for marketplaces, trading communities, outsourcing, open sourcing, buying consortia, auctions, supply chain integration and "virtual enterprises" that are fundamentally different...

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Networks of Commerce Communities

Assembly Outsourcing

Distribution

Supply Chain

Customers

Enterprise

Indirect Procurement

Markets

Procurement Outsourcing

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Evolving Solutions Roadmap

e-Marketplace to e-Marketplace
E2E Connectivity

Complex Business Process / Direct Goods
*Collaboration, Logistics, Forecasting,
Supply Chain Management*

Simple Buying & Selling
Indirect goods

Point to Point
Phone, Fax, EDI

Evolution of Business Technology

Enterprise Model

- Calculation
- Host based Computing
- Internal
- Control
- Single Data Model
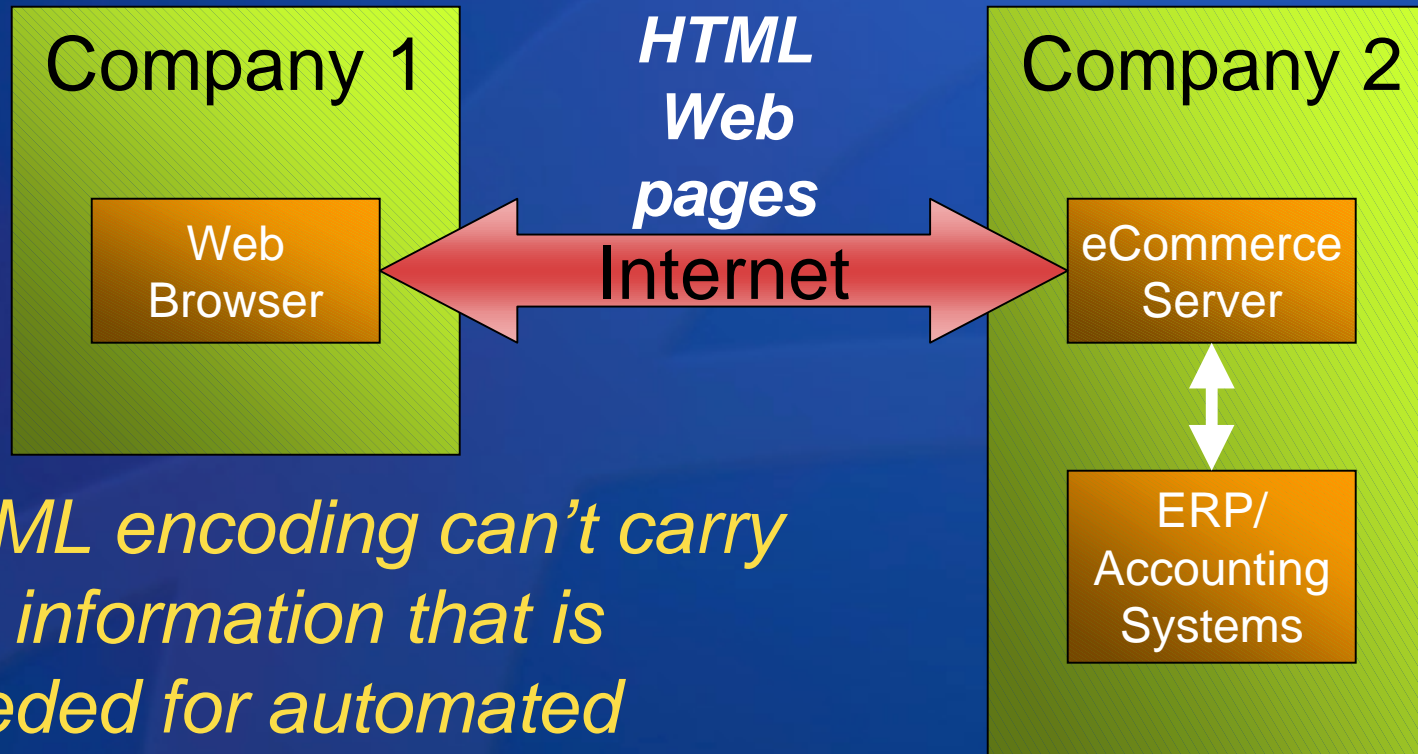- Single Entity Process
- Administration

E-Marketplace Model

- Communication
- Internet Computing
- Inter-entity
- Collaboration
- Multiple Data Models
- Inter-entity process
- Commerce

Internet Business Models & Integration Requirements

- Business models and relationships are experimental and evolving and have shorter lifetimes overall

- "Describe once, {sell,buy} anywhere" is the goal

- Both initial integration cost and incremental cost to evolve must be low

- Point-to-point coupling approaches won't scale

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Connecting with HTML ("by eye')

Company 1

Web Browser

HTML Web pages

Internet

Company 2

eCommerce Server

ERP/ Accounting Systems

HTML encoding can't carry the information that is needed for automated e-commerce --> manual data entry or "scraping and hoping"

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HTML's Limitations for Integration

- **The Web was created as a publishing medium, not as an e-commerce platform**

- **HTML, the Web's language for encoding information, is format-oriented and meant to be understood "by eye"**

  - **simple structures: headings, lists, links**

  - **Browsers are "hard wired" to render HTML as web pages**

- **No content-based encoding means that HTML can't be effectively searched or processed by business applications**

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Sample HTML Catalog Entry

```
<body>
<p><b>The Compaq Armada300 Family</b>
<ul>
<li>Ultra portable form factor - 3.2 - 3.4 lbs. light
      and .9 in. thin
<li>Large 12.1 in. CTFT display and full function
      keyboard at 95 percent full notebook size
<li>Intel Mobile Pentium III processor
<li> $2,399 is the Internet price for the Armada M300
      part number 165288-002
<li>Compaq recommends Windows 2000
      Professional for business
</ul></body>
```

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The XML Revolution

XML: Extensible Markup Language

- **Instead of a fixed set of format-oriented tags, XML allows you to create whatever set of tags are needed for your type of information**

- **This makes any XML instance "self-describing" and easily understood by computers and people**

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Gratuitous Clip Art Slide

HTML

Browsers

Computers

XML

Browsers

Computers

Computers

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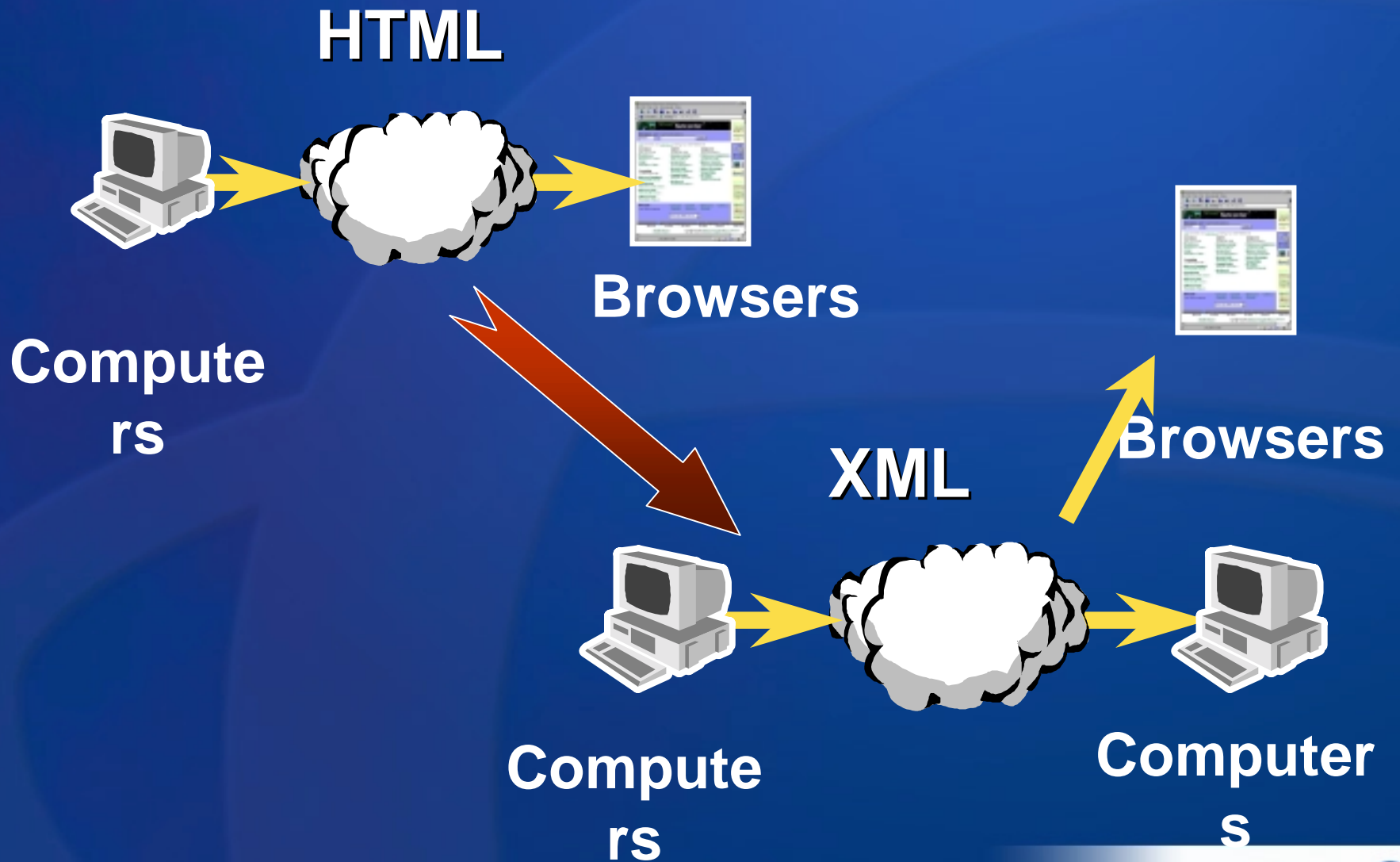
XML's Big Idea: Document Types

XML allows you to create whatever set of tags are needed for your type of information

- Catalogs
- Price Lists
- Purchase Orders
- Invoices
- Inventory Reports

- Bill of Materials
- Payments
- Schedules
- Forecasts
- ….*whatever you need*

The formal definition of permitted elements, attributes, and the rules by which they combine is called a <u>Document Type Definition</u> or <u>DTD</u> or <u>schema</u>

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Catalog Entry in XML
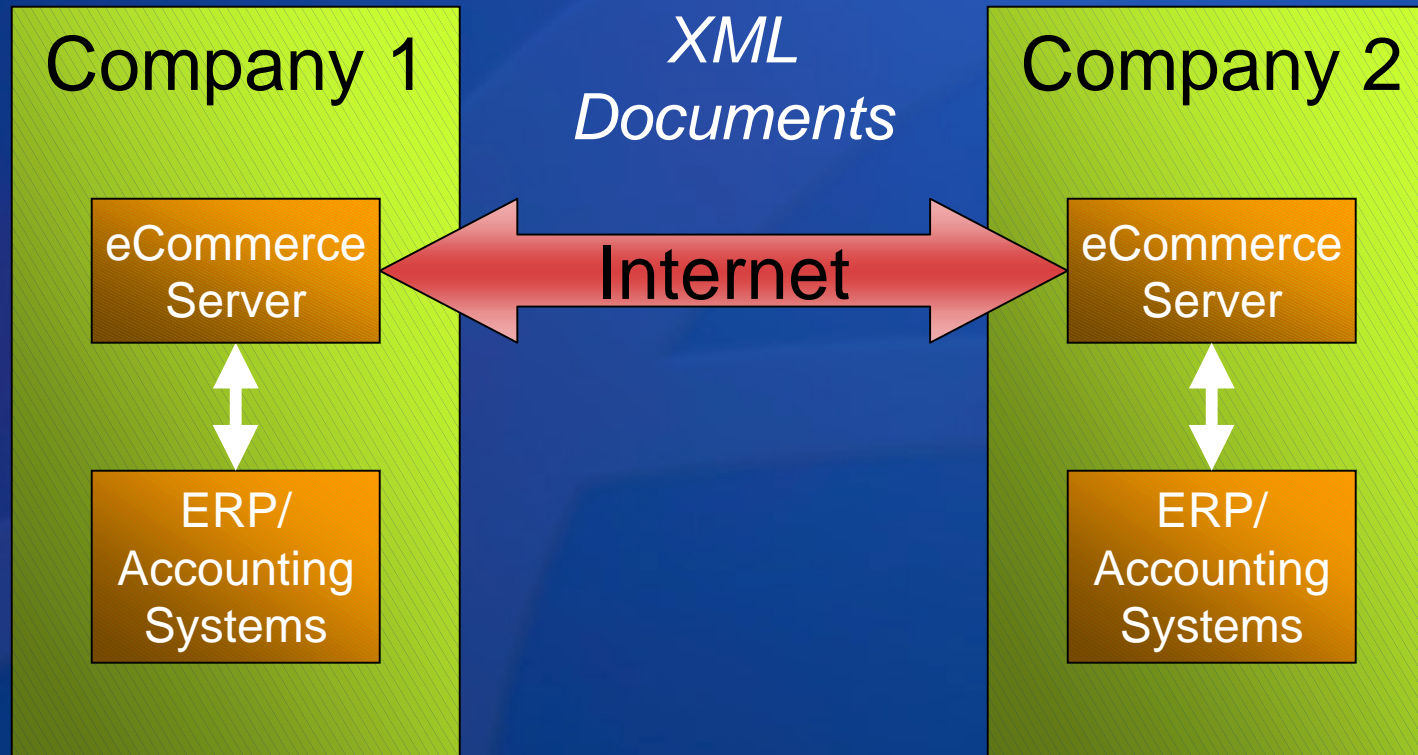
```
<computer type="Notebook">
<oem series="Armada300">Compaq</oem>
<specs>
  <partno>165288-002</partno>
  <display type="CTFT"
       unit="in">12.1</display>
  <processor>Intel Mobile Pentium III
       </processor>
  <weight unit="lb">3.2</weight>
  <price currency="USD">2399</price>
  <os>Windows 2000 Professional</os>
</specs>
</computer>
```

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Smart Processing with XML

- **XML enables content and hierarchical encoding and separates that from formatting, which is controlled by browser "style sheets"**

- **`<computer>` and `<specs>` provide logical containers for extracting and manipulating product information as a unit**

  - **could sort products by `<oem>`, `<processor>`, `<weight>`, `<price>`, etc.**

- **Explicit identification of each part enables its automated processing without "scraping and hoping"**

  - **Convert `<price>` from "USD" units to Euro, Yen, etc.**

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Connecting using XML

Company 1

eCommerce Server

⬍

ERP/ Accounting Systems

XML Documents

⬌ **Internet** ⬌
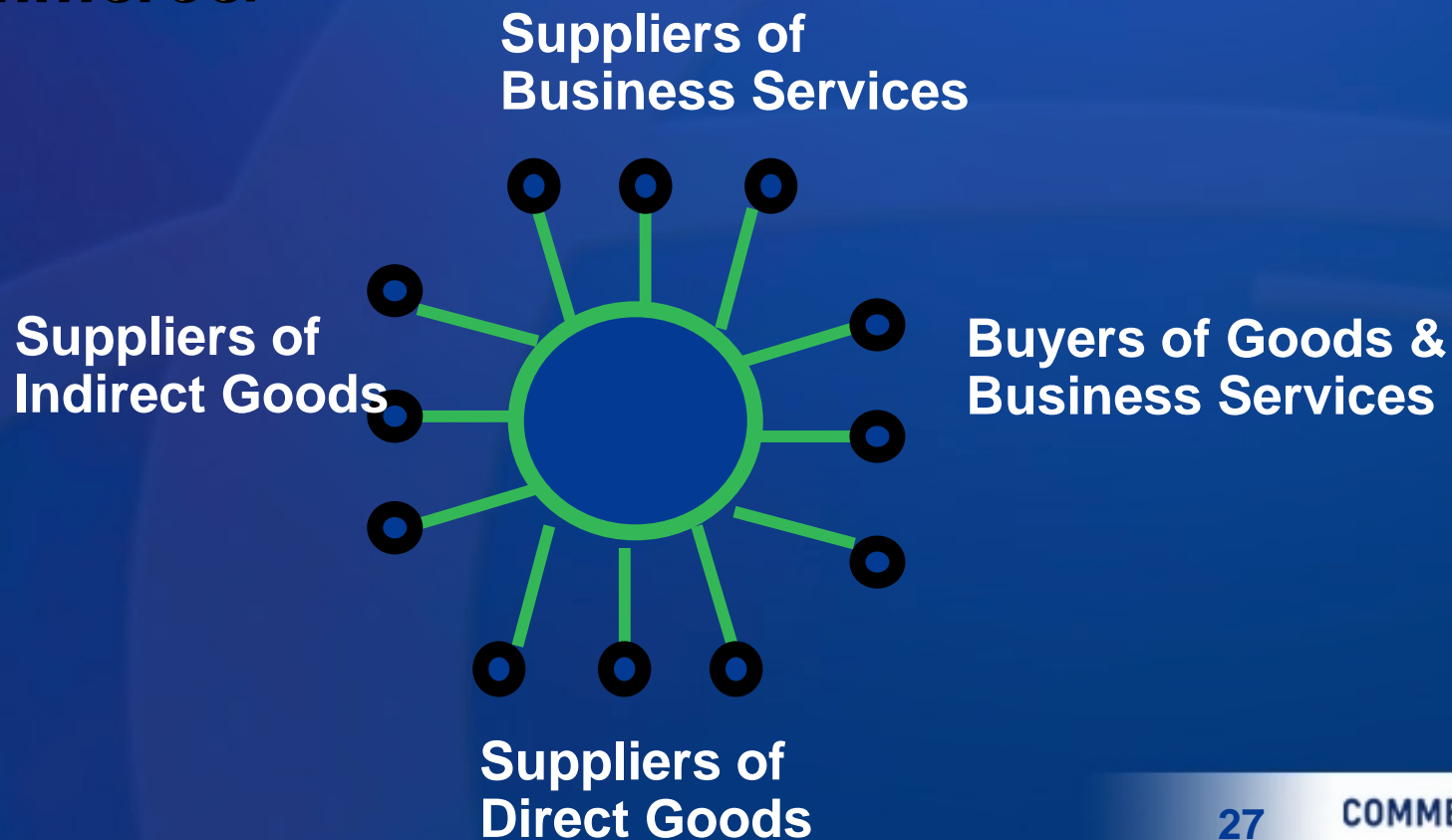
Company 2

eCommerce Server

⬍

ERP/ Accounting Systems

Benefit: *XML can be processed automatically with huge cost savings*

Problem: *Company 1 and Company 2 have to agree on document format*

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Electronic Marketplaces and Marketplace Networks

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E-Marketplace Architecture

An e-marketplace is a destination on the Internet built on a commerce platform that brings businesses together to conduct e-commerce.

Suppliers of Business Services

Suppliers of Indirect Goods

Buyers of Goods & Business Services

Suppliers of Direct Goods

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Marketplace Networks
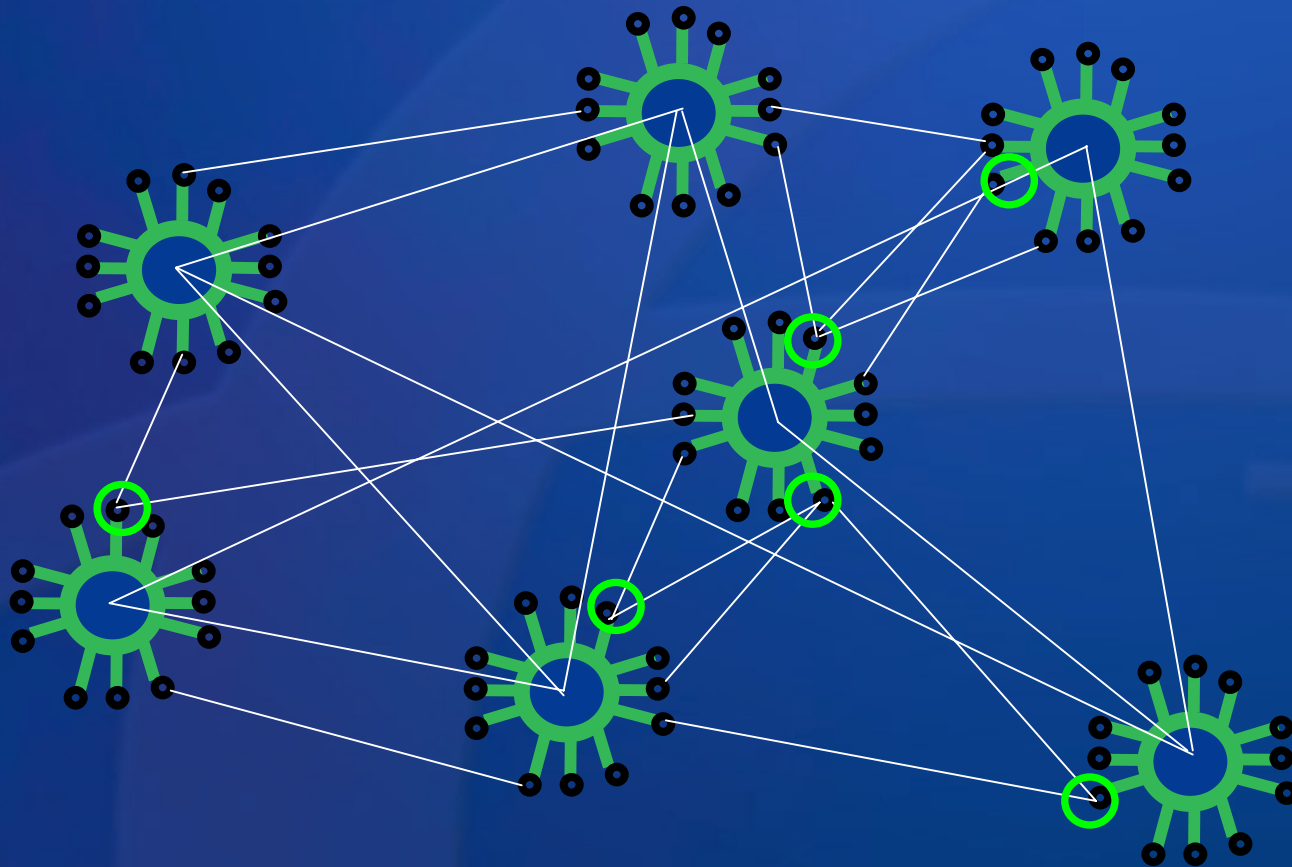
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Commerce One E-Marketplace Solution

- **Commerce One creates a highly transparent commerce community with suppliers, partners, and customers**

- **Commerce One provides a complete e-business solution**
  - **Strategy, Platform, Software, Services**

- **Commerce One accesses existing enterprise systems with the disparate technologies of suppliers, partners, and customers**

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Commerce One's Global Solutions for B2B

Horizontal

Enterprise
Buyers

- Only Complete B2B end-to-end solution for Buyers & Sellers, Market-makers

- 34 Portals providing infrastructure and trading services as part of the Commerce One Global Trading Web

- Adopted by industry leading Market Makers across Multiple Industries

- 1000s of Buyers & Sellers e-Commerce enabled by Commerce One

- Live Today and Processing tens of thousands of e-Commerce transactions!

Service
Providers

Exchanges

e-Marketplaces

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Making Money in B2B -- Vendors

- **Selling software and services to create the e-marketplace technology foundation**

- **Fees based on the the complexity and volume of transactions**
  - **what counts as a transaction?**
  - **who pays the fees -- buyers or suppliers?**
  - **fees for exchange-to-exchange transactions and syndicated services**

- **Ongoing sales of licenses, services, and transaction fees associated with technical and functional improvements**

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Making Money in B2B -- Vendors and Customers

- **Equity**
  - **owning a share of the new company created to run an e-marketplace**
  - **only valuable if the company can go public**
  - **not going to happen anytime soon**

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Making Money in B2B -- Customers

- **Market efficiency**
  - **driving costs out of supply chain for all participants**
  - **exploiting & refining existing business relationships & experience**
    - **putting an external "market face" on enterprise applications**

- **Standards are crucial to these concerns**

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Maximize The Network Effect by Interconnecting the Marketplaces

Economic Value

Number of Users

- **Connect once, trade anywhere -- drives the "network effect" and value increases exponentially for everyone in the trading community:**
  - **Buyers**
  - **Suppliers**
  - **Net Market Makers**
  - **Mega Exchanges**
  - **Business Service Providers**

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The Global Trading Web

- **The Global Trading Web is the world's largest business-to-business Internet trading community, comprised of many open e-marketplaces, accelerating the movement of global trade onto the web.**

"The Global Trading Web is the Internet enhanced for business."

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Regional E-Marketplaces that connect you around the Global Trading Web

SE Asia Consortium

Sinar Mas Group

Japan Consortium

BayanTrade.com

NTT Communications

Canada

TD BANK FINANCIAL GROUP

Philippines Consortium

Switzerland

conextrade

French Consortium

French Banks

CA

SOCIETE GENERALE

BNP

ComEB.net

Taiwan Consortium

SEAT PAGINE GIALLE

Banamex artikos

Italy

· · · T · ·

Central and South America

OPTIMUS

South Africa

Germany

BT

Israel Consortium

Asia2B

Poland

S.Korea Consortium

LG International Corp.

Greater China Consortium

citi CitiBank

United Kingdom

SESAMi
All Your Business Needs Online

India Consortium

COMMERCE ONE.

United States

Southeast Asia

opciona·com

PEOPLE Soft

CABLE & WIRELESS OPTUS

Trade.com

Spain

Australia & New Zealand

Portugal

E-Marketplaces -- Industry Consortia

Trade-Ranger
Energy
(BP Amoco, ARCO, Shell, TOTAL FINA ELF, OXY, REPSOL YPF, CONOCO, Mitsubishi Corporation, STATOIL, Dow, PHILLIPS 66, TEXACO, UNOCAL, TOSCO, MOTIVA, EQUILON)

EXOSTAR
Aerospace
(Raytheon, BOEING, LOCKHEED MARTIN, BAE SYSTEMS)

forestexpress
Forest Products
(Weyerhaeuser, Georgia-Pacific, INTERNATIONAL PAPER, Mead)

MOVIE MAGIC MARKETPLACE
Film and Television

@ BELLSOUTH
Telecommunication

Mining and Metals Procurement Marketplace
Metals & Mining (16 Companies)

Mitsubishi Corporation
Japanese Gas, Chemicals & Utilities

high-tech exchange
Electronics
(HP, COMPAQ, NEC, AMD, Gateway, HITACHI, Agilent Technologies, SAMSUNG, Canon, Western Digital, TATUNG, Quantum, SYNNEX, SOLECTRON, SCI Systems, Inc.)

OUTDOORS
Outdoor Products and Services
(COMMERCE ONE, STERLING COMMERCE)

ENPORION
N. America Utilities (5 Companies)

COVISINT
Automotive
(GM, Ford, DAIMLERCHRYSLER, RENAULT, NISSAN)

CDI Procure
opening for business
**e-Procurement Consortium (14 Companies)**

Pantellos
Global Utilities (15 Companies)

Document Exchange Architecture for Electronic Marketplaces and Marketplace Networks

What Defines a Marketplace?

- The "market maker/operator"
- The participating businesses
- The services these businesses provide to each other
- The messages and documents that are exchanged to request and perform the services

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Integrated Business Services are XML Document Exchanges
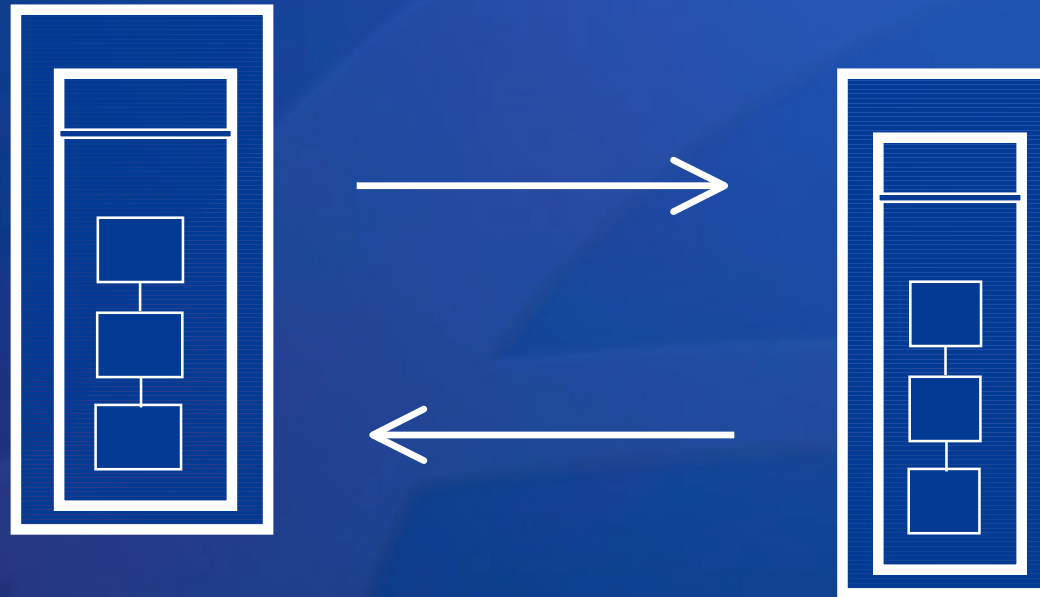
If you send me a **catalog request**, I will send you a **catalog**

If you send me a **purchase order** and I can fulfil it, I will send you a **purchase order response**

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XML Document Exchange Architecture

- **Document exchange is a more natural way to think about doing business**
  - Less brittle than APIs (how enterprise sw vendors think)
  - More consistent with legacy EDI
- **XML is application and vendor neutral, making it easy to provide "open" marketplace with 3rd party buying and selling apps and other marketplace services like payment, taxation, logistics…**
- **Document exchange between marketplaces is fundamentally the same as within a marketplace -> Global Trading Web**

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The XML
Common Business Library (xCBL)

There are many different "standard" document formats
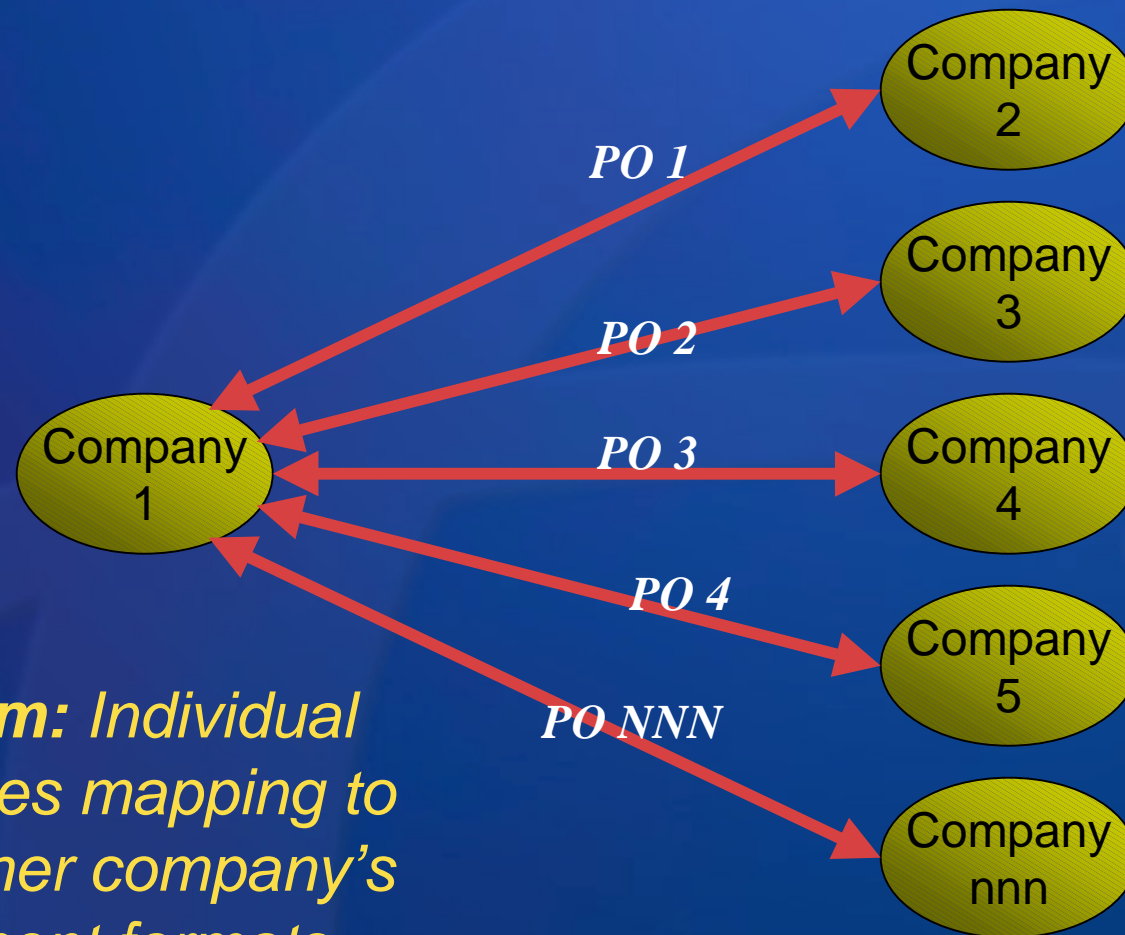
Problem: *Individual companies mapping to every other company's document formats doesn't scale*

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XML and Metcalfe's Law

- **The value of a language depends on how many people (or computers) understand it**

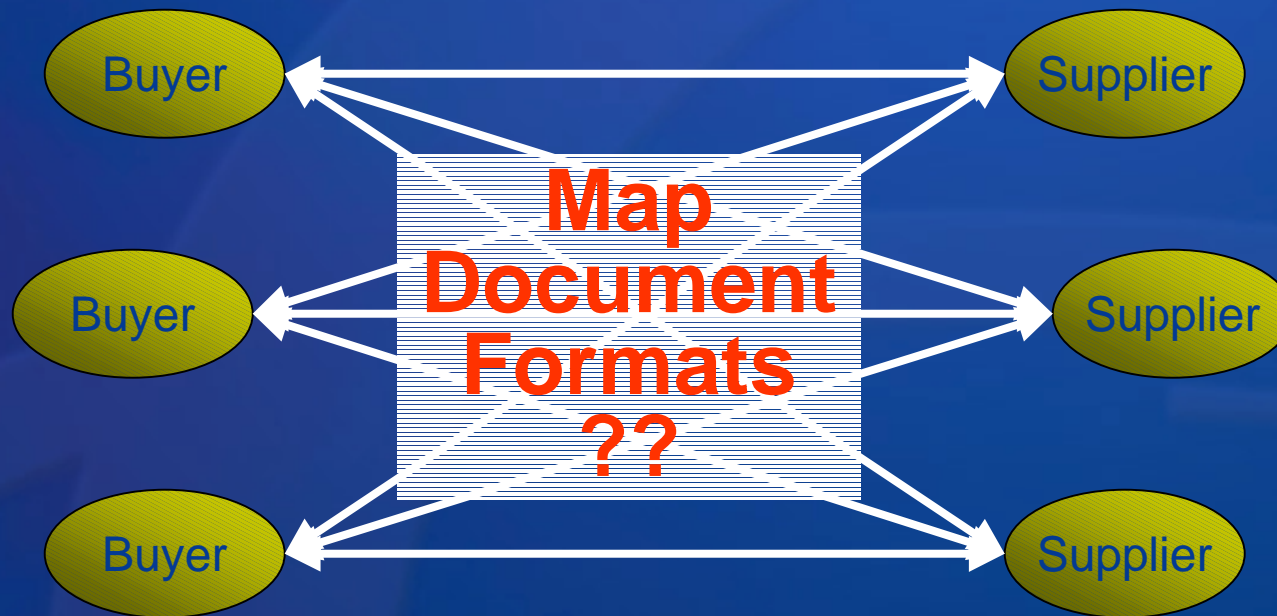- **How do you encourage and enable others to understand your language?**

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XML and Metcalfe's Law

- **Traditional EDI approach:**

  - **BIG COMPANY:**
    Speak MY language or I won't do business with you!

  - **SMALL COMPANY:**
    Yes, master.

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XML and Metcalfe's Law

- **The XML approach:**

  - **Excuse me, please, here are the rules of my language if you'd like to speak with me…**

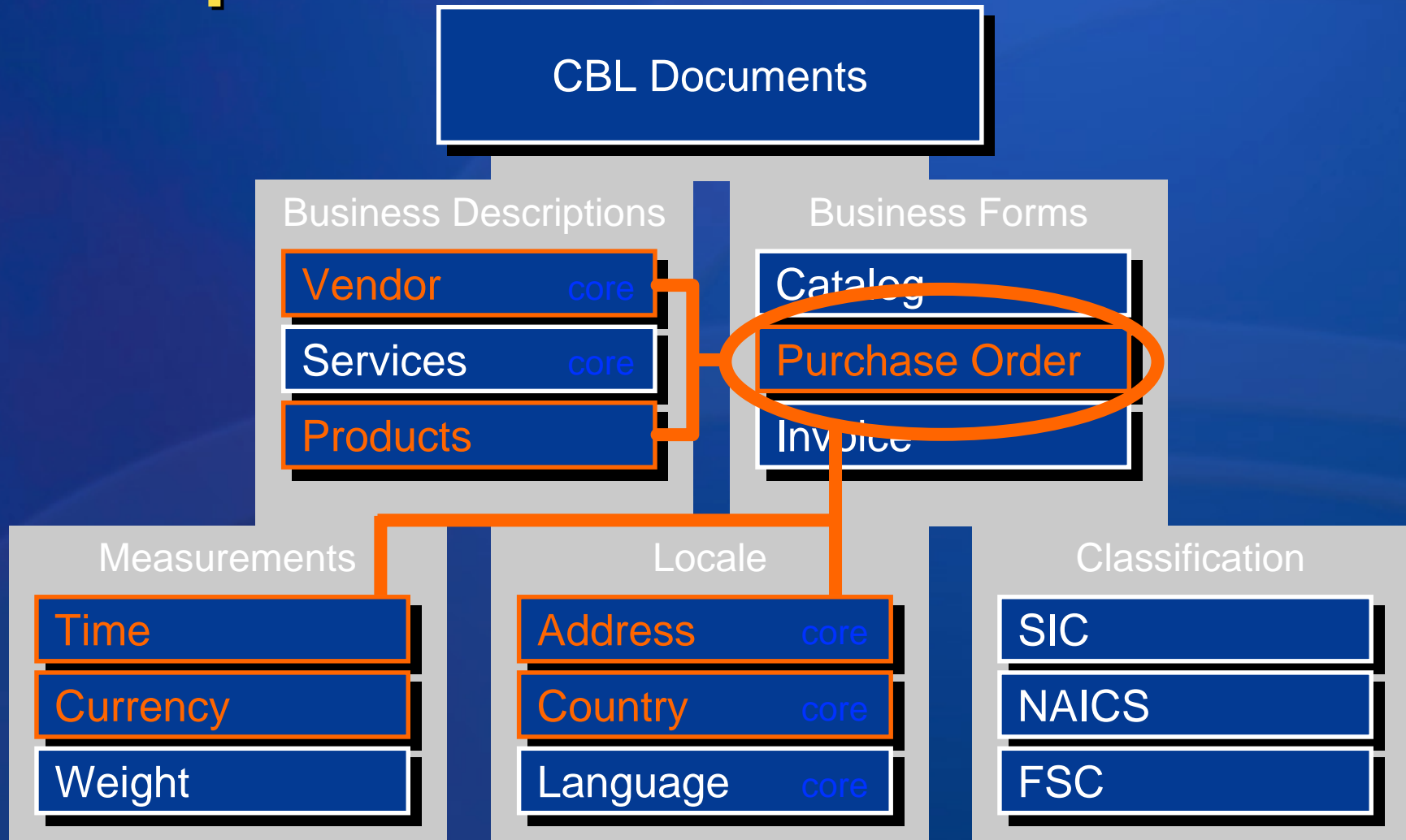**COMMERCE ONE.**

N x N Document Mapping Doesn't Scale !

Buyer

Buyer

Buyer

Supplier

Supplier

Supplier

Map Document Formats ??

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The XML Common Business Library

- The FIRST "horizontal" XML specification (started 3/97)
  - **a set of reusable XML components that are common to many business domains**
  - **a framework for creating documents with a common architecture**
  - **we were so far out in front here that this work was partly funded by a research grant from the US Department of Commerce's Advanced Technology Program in October 1997**
- Documents built and extended according to the CBL frameworks can be understood from their common message elements
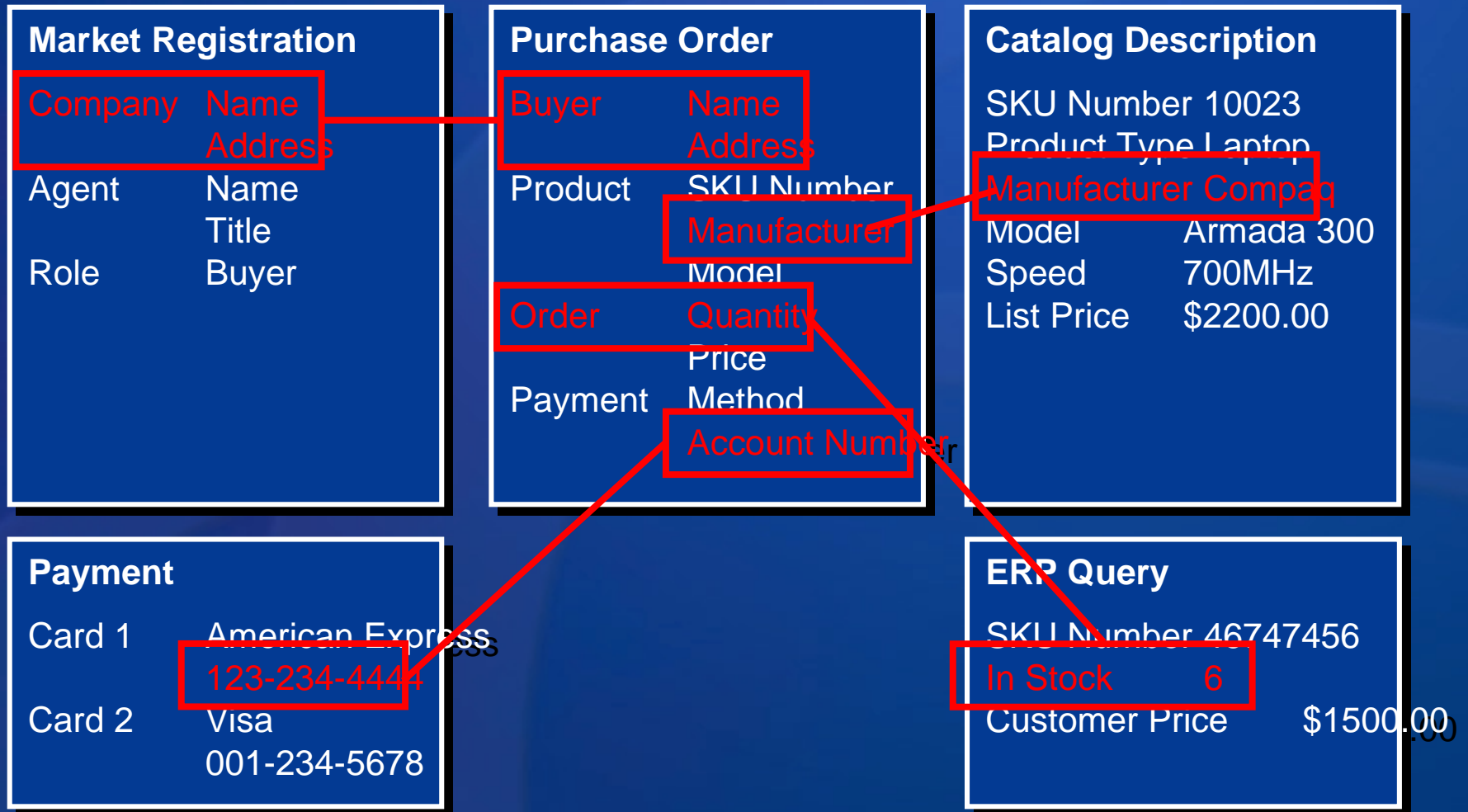
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Building Documents from Components

CBL Documents

Business Descriptions
- Vendor *core*
- Services *core*
- Products

Business Forms
- Catalog
- Purchase Order
- Invoice

Measurements
- Time
- Currency
- Weight

Locale
- Address *core*
- Country *core*
- Language *core*

Classification
- SIC
- NAICS
- FSC

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XML Component Architecture: The Architectural Key to B2B

- Simple services can be combined into aggregated services to support complex business processes -- and much information is reused from service to service
  - Procurement = catalog + purchase order + shipping notice + invoice + payment etc. ...
- Intra- and inter-company reuse of information between the different steps in a business process:
  - Drives costs out of business relationships
  - More efficient, robust, and scaleable integration
  - Reduces Inter-enterprise cycle time
  - Extends ERP between enterprises

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Evolution of the XML Common Business Library

- **xCBL drives and has been driven by Commerce One's extensive participation on XML and XML/EDI standards activities**

- **Its ongoing evolution and management are transitioning outside of Commerce One as we make it a de facto (and maybe de jure) standard**

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xCBL 3.0 Business Processes and Documents (www.xcbl.org)

- **Catalogs / Catalog Management (2 documents)**
- **Order Management (8 documents)**
- **Shipping/Planning (4 documents)**
- **Invoicing & Payment (5 documents)**
- **Availability (4 documents)**
- **Auction & RFQ (6 documents)**
- **Trading Partner Information (5 documents)**
- **Supply Chain Statistics (3 documents)**
- **… more on the way (logistics, intn'l trade)**

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XML {vs., and, or} EDI

Perspective of Company Creating a New Internet Marketplace

Implementation
& Maintenance
Cost

EDI

XML

Benefit of Using XML Syntax

Time

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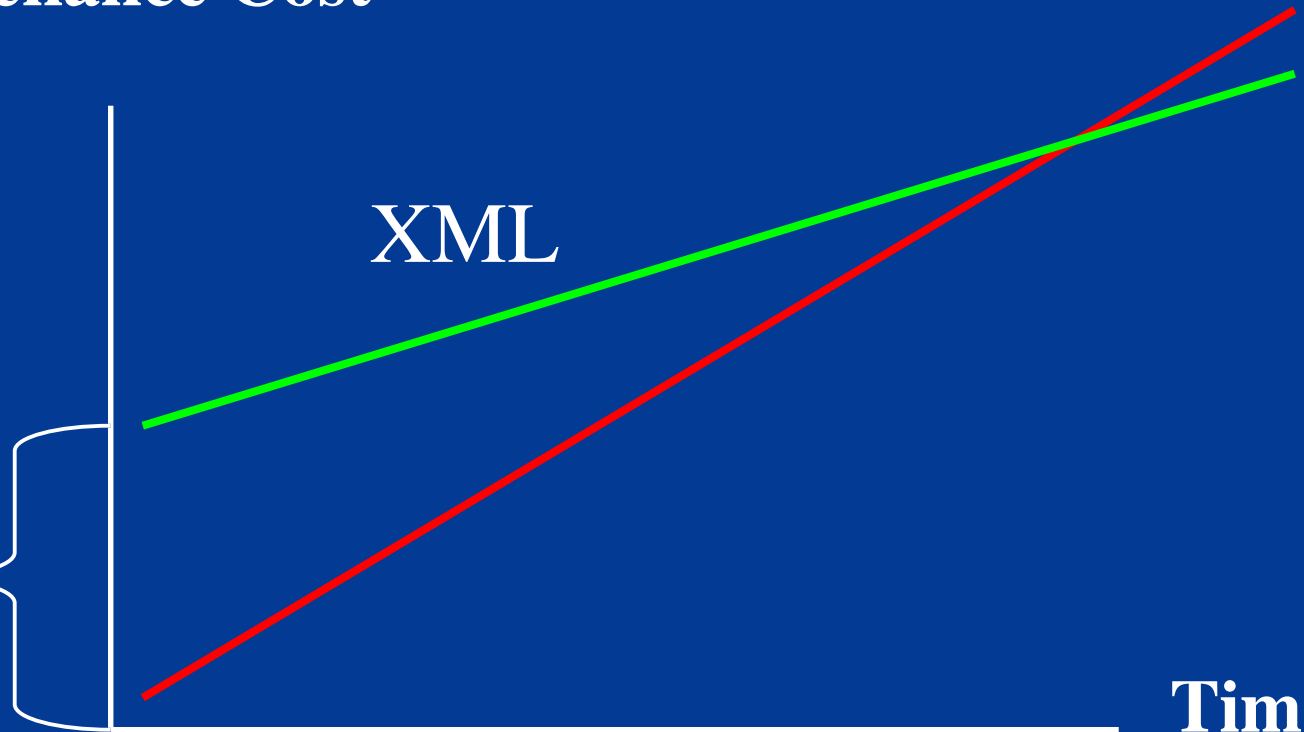# Perspective of EDI-enabled Buyer or Supplier

Implementation & Maintenance Cost

EDI

XML

Cost of creating XML document types and mapping to/ from EDI
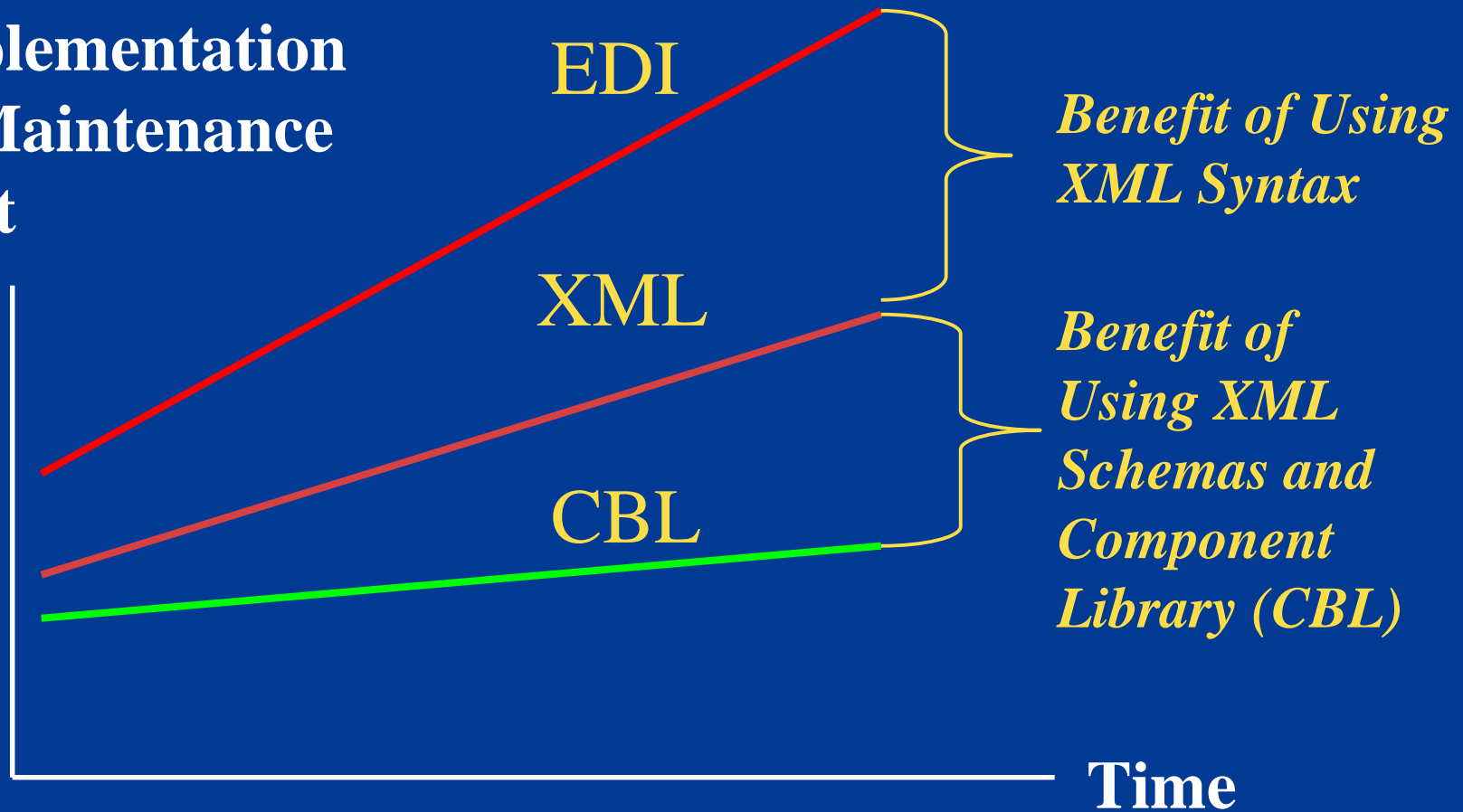
Time

So EDI must be part of the solution, too...

- EDI is **_NOT_** dead. Most of our big customers (auto, aerospace, petroleum, utilities, etc.) are heavily invested in EDI

- We must preserve the business processes and expertise embedded in their EDI implementations

- We do this in a way that supports a technical migration path to XML and a value proposition that justifies making the transition

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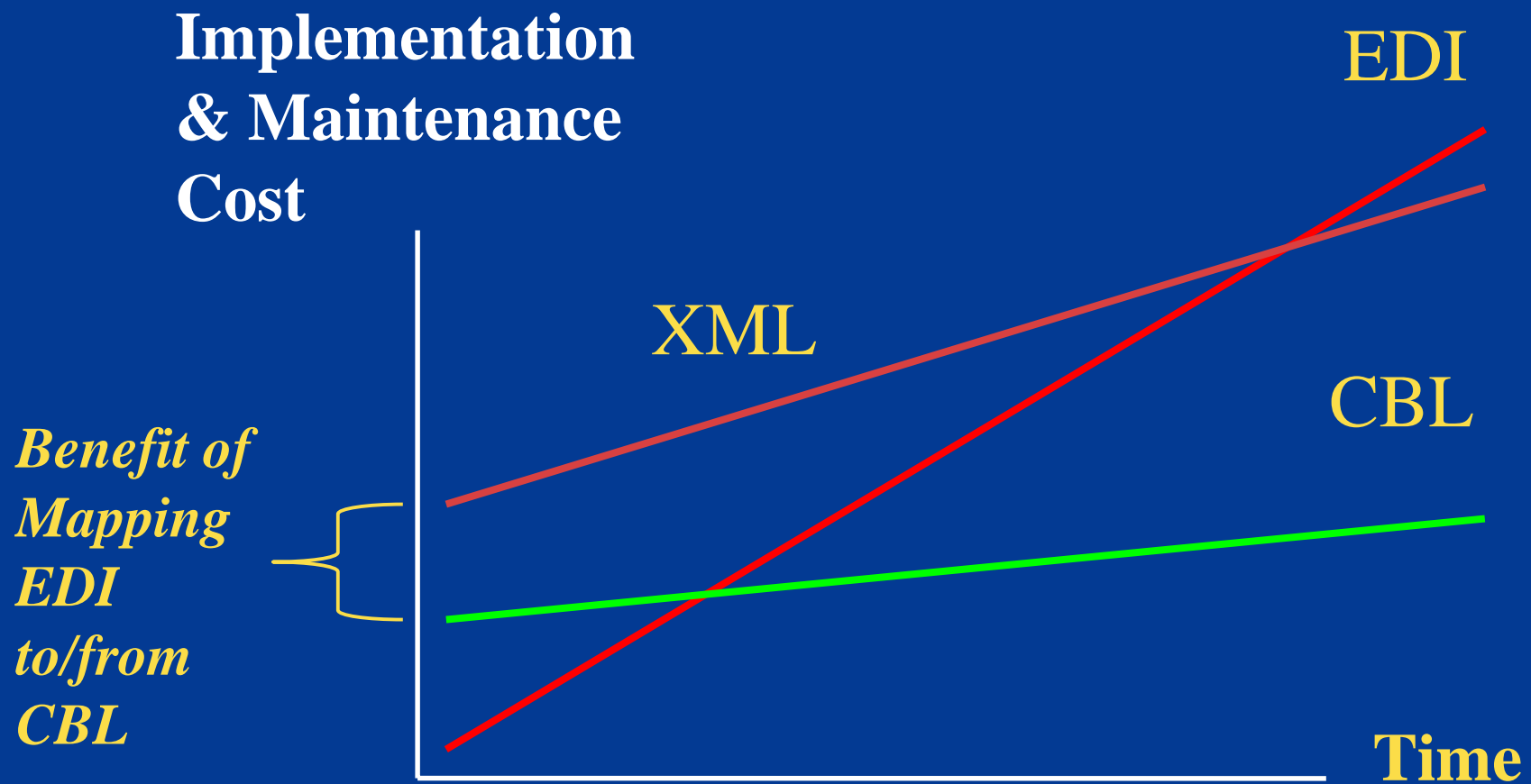
xCBL Combines EDI and XML

- **EDI standards provide a strong non-proprietary semantic foundation for xCBL**

- **Companies using EDI today see a clear migration path in xCBL for mapping from EDI applications to XML**

- **SMEs for whom EDI is not cost-effective can use xCBL in simple Web applications to interoperate with EDI partners**

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Marketplace Operator's Perspective with xCBL
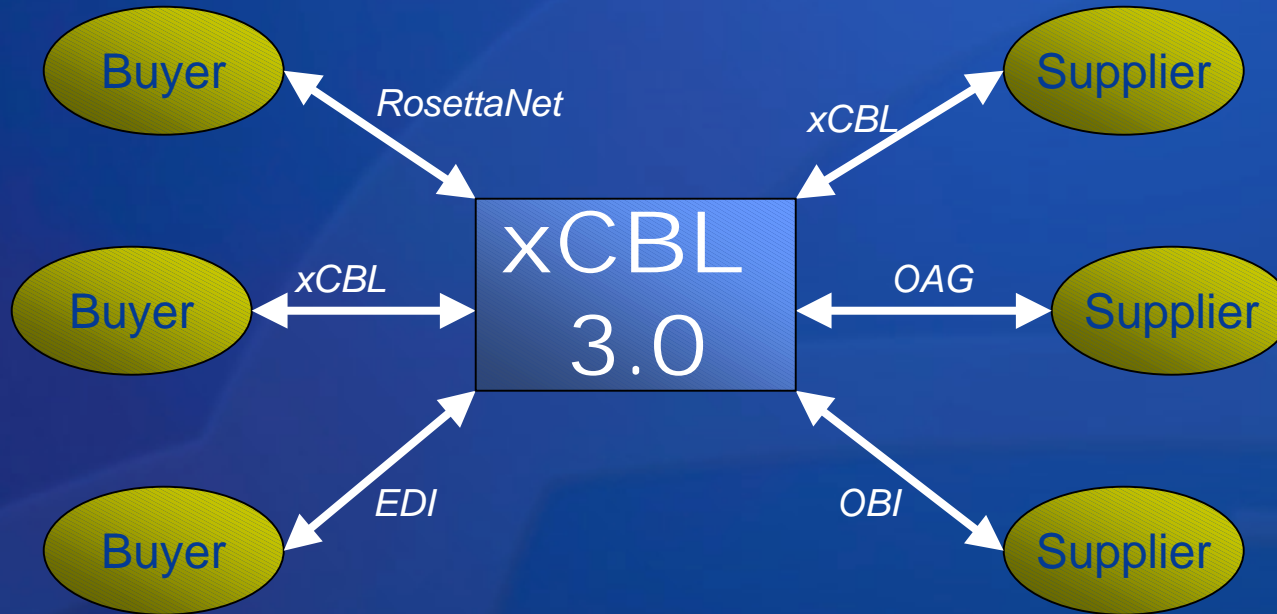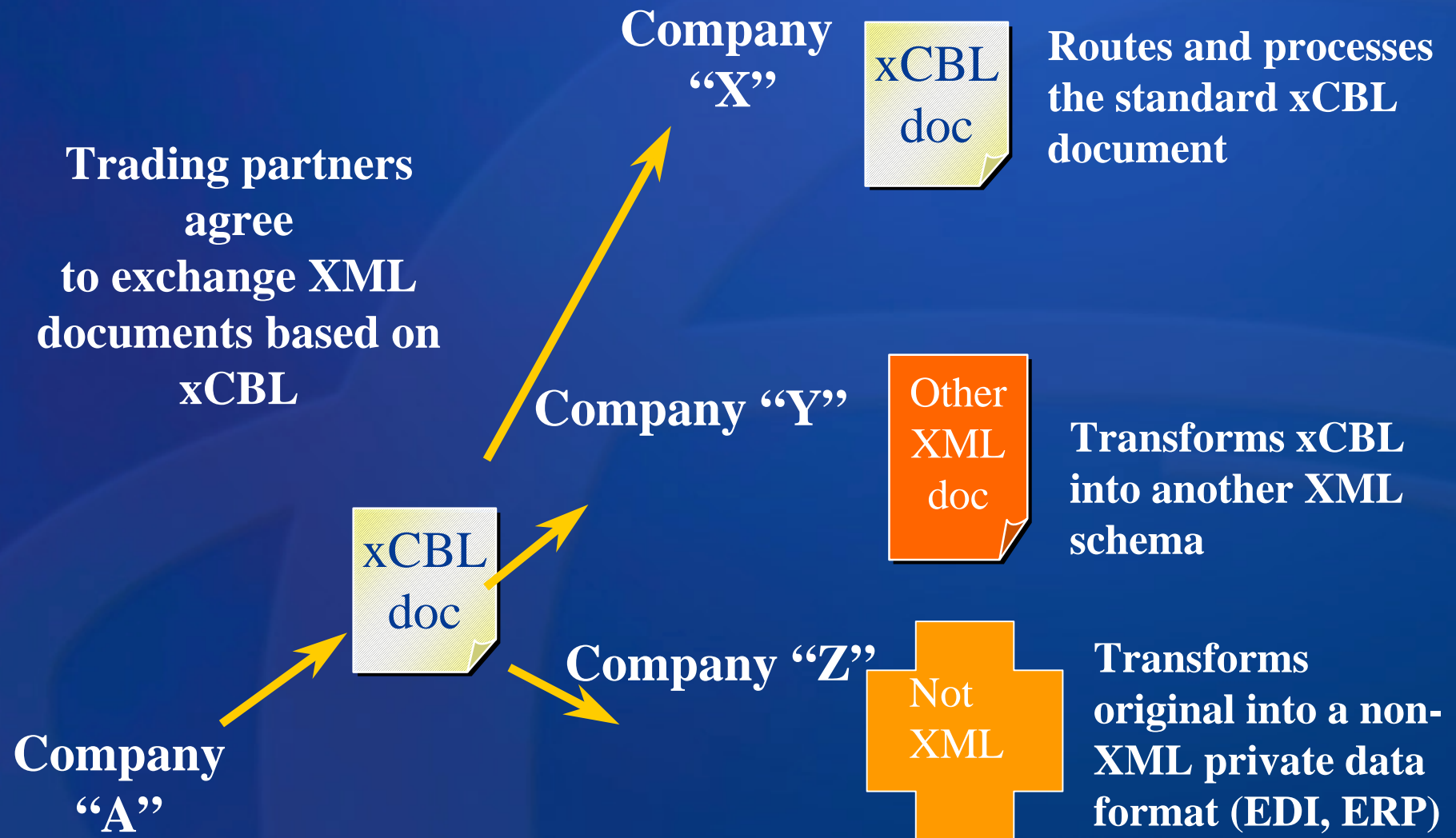
Implementation & Maintenance Cost

EDI

XML

CBL

Benefit of Using XML Syntax

Benefit of Using XML Schemas and Component Library (CBL)

Time

EDI with xCBL

xCBL and Interoperability

xCBL 3.0 – The Interoperability Standard


```
    Buyer                                      Supplier
          RosettaNet              xCBL
                    ┌──────────┐
    Buyer    xCBL   │  xCBL    │   OAG    Supplier
                    │   3.0    │
                    └──────────┘
          EDI                      OBI
    Buyer                                      Supplier
```

xCBL's robust component architecture enables it to map between all the major eCommerce document standards

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xCBL for Interoperability

Trading partners agree to exchange XML documents based on xCBL

Company "X"

xCBL doc

Routes and processes the standard xCBL document

xCBL doc

Company "Y"

Other XML doc

Transforms xCBL into another XML schema

Company "Z"

Not XML

Transforms original into a non-XML private data format (EDI, ERP)

Company "A"

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How xCBL Enables the Global Trading Web

- **Every Marketplace in the GTW begins with standard business services implemented using XML document interchanges defined using xCBL**

- **This ensures that:**

  - **some standard versions of common business services are available everywhere**
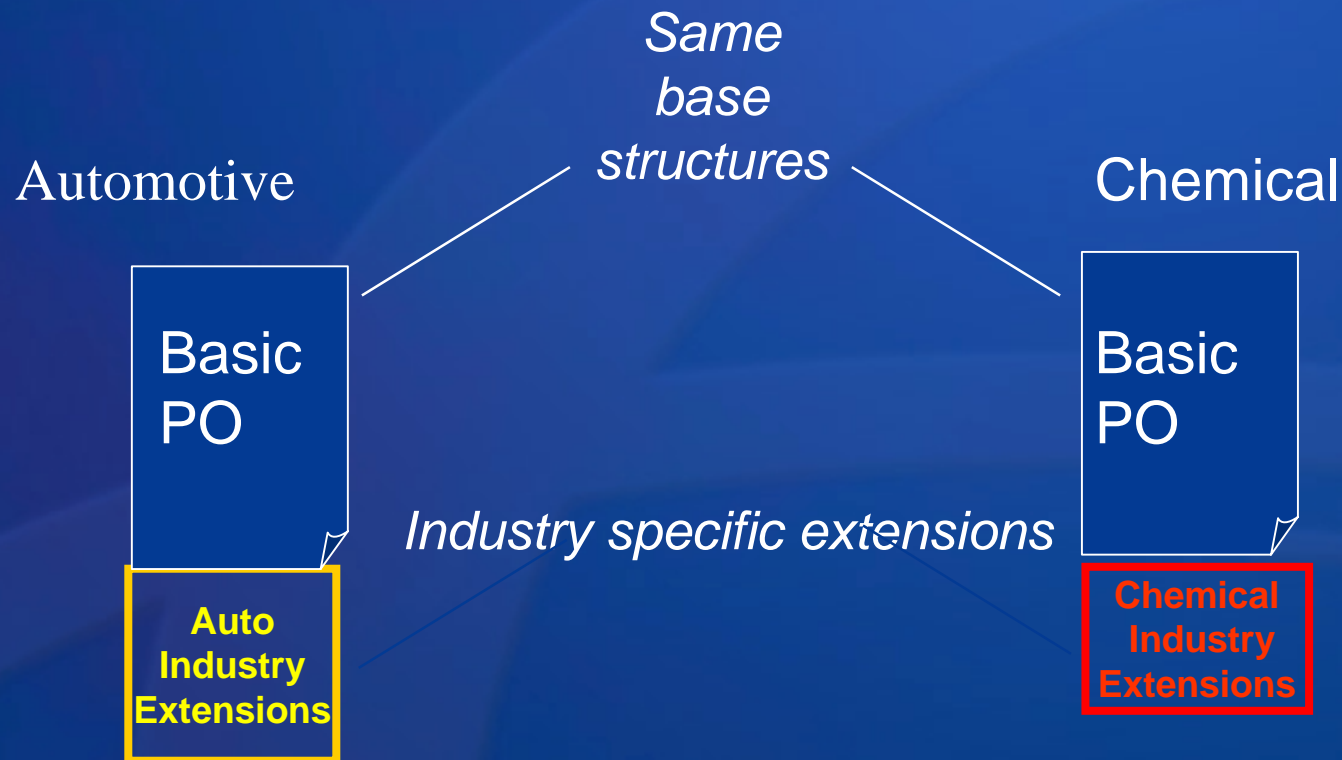
  - **the standard messages mean the same thing everywhere**

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Customization with Interoperability

- **Any market operator or business can develop a new or enhanced service, register it and the XML documents that it uses, and make it available to other businesses within its marketplace and throughout the GTW**

- **These new or customized services are implemented using the standard components whenever possible**

- **This reuse enables vertical and regional Marketplaces to interoperate on the basis of their shared xCBL document cores**

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Object-oriented Document Design enables Backward Compatibility

Same base structures

Automotive

Chemical

Basic PO

Basic PO

Industry specific extensions

Auto Industry Extensions

Chemical Industry Extensions

The extensions needed in each industry can be recognized and ignored by the other

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Commerce Standards as "Marketsite Onramps"

Commerce Standards are "Marketsite Onramps"

- **Not all trading partners will use the same commerce standards**

- **Commerce One's efforts in XML standards are working to achieve convergence or harmonization**

- **But in the meantime, Marketsite needs to be able to connect to anyone regardless of the standard they use**

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"Connector Onramp"

- **Parties connect to MarketSite using Commerce One XML connector technology on both ends to send and receive documents**

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"Gateway Onramp"

- **Trading partner sends/receives using alternate standards with no added work**

- **MarketSite responsible for**
  - **Document Mapping**
  - **Understanding the alternate standard**

- **MarketSite accepts or sends the alternative protocol in its native form**

- **MarketSite Operators can charge fees for conversion service**

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