

Verteilte Systeme

3. Dienstevermittlung

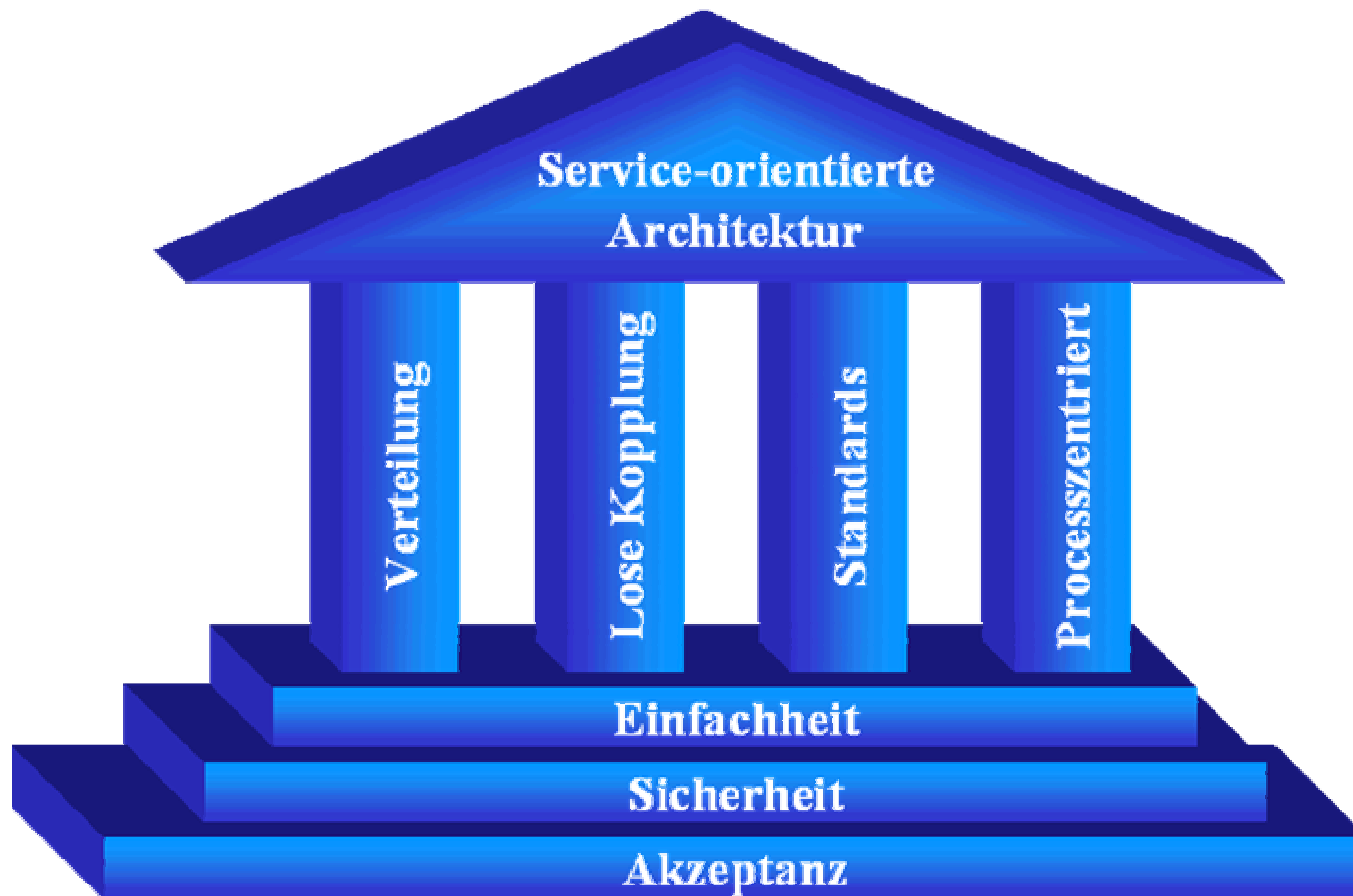
3.2 Prinzipien einer serviceorientierten Architektur (SOA)

Sebastian Iwanowski
FH Wedel

Prinzipien einer SOA

- 1. Definitionen und Merkmale einer SOA**
- 2. Semantic Web**
- 3. Evolution and architecture**
- 4. Integrating SOA with WWW**
- 5. Business Processes in SOA**

Der SOA-Tempel



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Merkmale einer SOA

- **Verteilung**

Autonomie

- **Lose Kopplung zwischen den Diensten**

- **Standards**

z.B. Web Services, Semantic Web

- **prozessorientiert**

Verknüpfung von Diensten, nicht von Daten

- **Einfachheit**

z.B. Statuslosigkeit, Bekanntgabe nur der Servicebeschreibung

- **Sicherheit**

- **Akzeptanz**

Beteiligung vieler, offene Standards

- **Verzeichnisdienst**

- **Dynamisches Binden**

Merkmale einer SOA

Häufige Fehldefinition von SOA:

~~Anwendungen die Web Services nutzen~~

Das ist weder notwendig noch hinreichend!

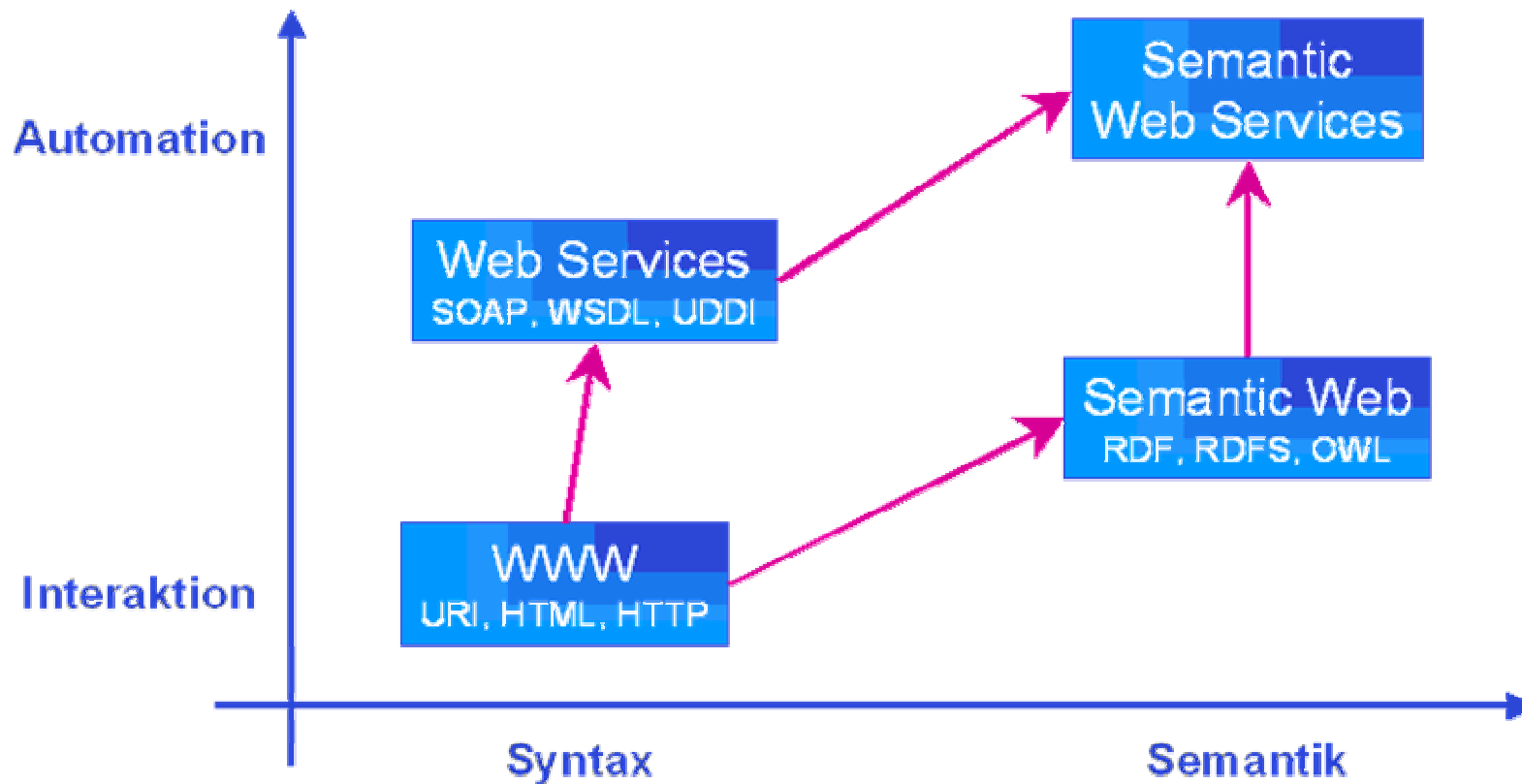
Besser:

Anwendungen die auf Serviceorientiertheit basieren

- Kapselung von Businesslogik in Services
- Bindung an Web-Service-Prinzipien
- Einführen einer neuen Schicht

SOA und Web Services

Mit Web Services kann eine SOA realisiert werden,
aber nur ein Teilaspekt:



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Prinzipien einer SOA

1. Definitionen und Merkmale einer SOA
2. **Semantic Web**
3. **Evolution and architecture**
4. **Integrating SOA with WWW**
5. **Business Processes in SOA**

Semantic Web

Motivation

Current Web is an impressive success story

- Available information
- Growth rate of human users

Web success based on its simplicity

- ...also brings critical drawbacks
 - Search results are imprecise
 - Difficult maintenance
 - Chaos and time consuming!!

What is the Web now?

- ~~• “A place where people do the work, linking and interpreting, and computers sit back and do the presentation” [Goble 2003]~~
- Why don't we make computers do the work?

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Semantic Web

Definition

The Semantic Web is an extension of the current Web in which information is given well-defined meaning, better enabling computers and people to work in cooperation.

It is based on the idea of having data on the Web defined and linked such that it can be used for more effective discovery, automation, integration, and reuse across various applications.

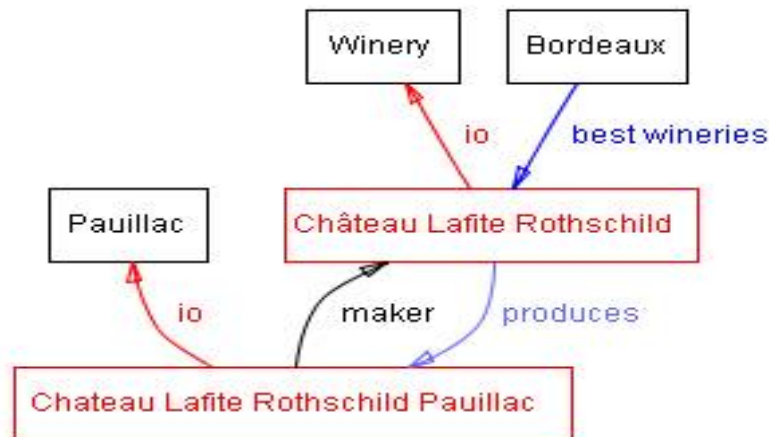
Semantic Web

Ontologies

Ontologies are introduced to provide machine-understandable semantics:

- “Formal, explicit specification of a shared conceptualization”

Typical ontology consists of a hierarchical description of important concepts and their relations in a domain, task or service:



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Semantic Web

Ontologies

Main components of an ontology:

- **Classes:** concepts of the domain tasks, usually organized in taxonomies and contain attributes
- **Relations:** express relationship between concepts in the domain
- **Functions:** Special case of relations in which the n-element of the relationship is unique for the n-1 preceding elements
- **Axioms:** model sentences that are always true
- **Instances:** represent specific elements of the concepts, in contrast with general concepts or classes

Semantic Web

Ontologies

Benefits:

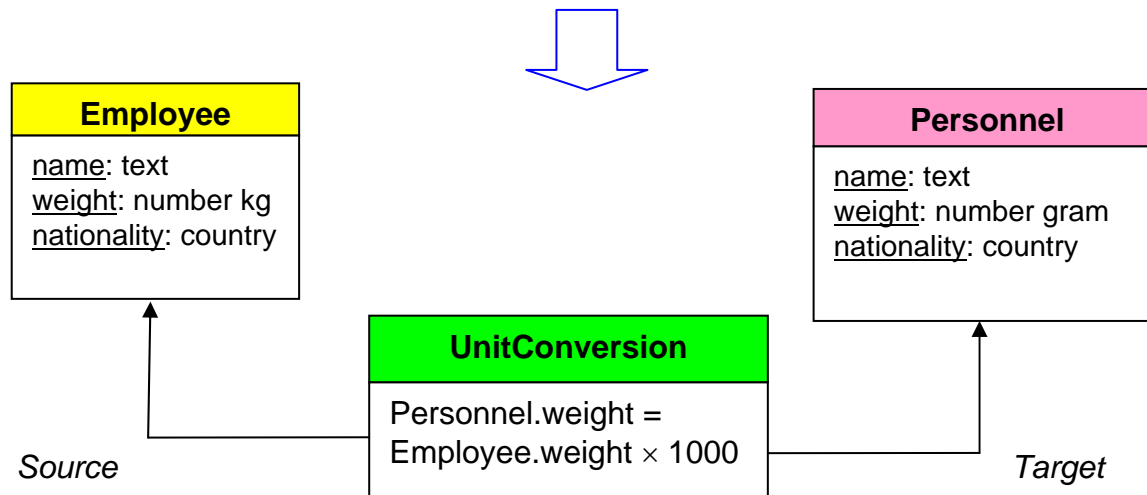
- Ontologies define formal semantics for information allowing information processing by a computer
- Ontologies define a real-world semantics allowing to link machine processable content with meaning for humans based on consensual terminology
- Ontologies enable human and computers to collaborate: machine processing + human intervention

Semantic Web

Ontologies

Problems:

- Are we expected to agree on a common ontology?
(It is unrealistic to expect all the experts, users and designers to agree on a common ontology for a given domain)
- Ontology alignment tries to overcome this unrealistic assumption



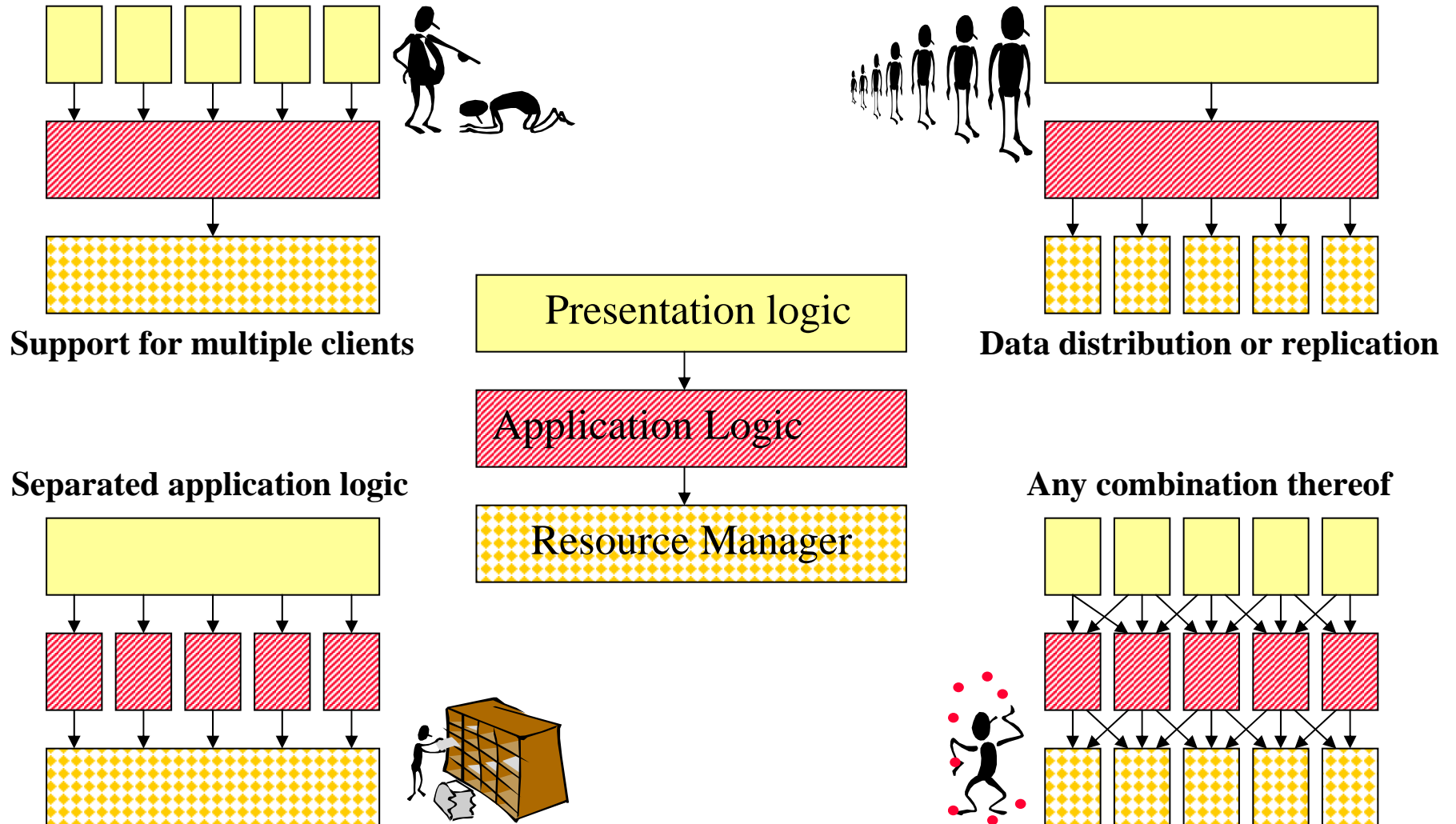
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Evolution of architectures

Layer Distribution

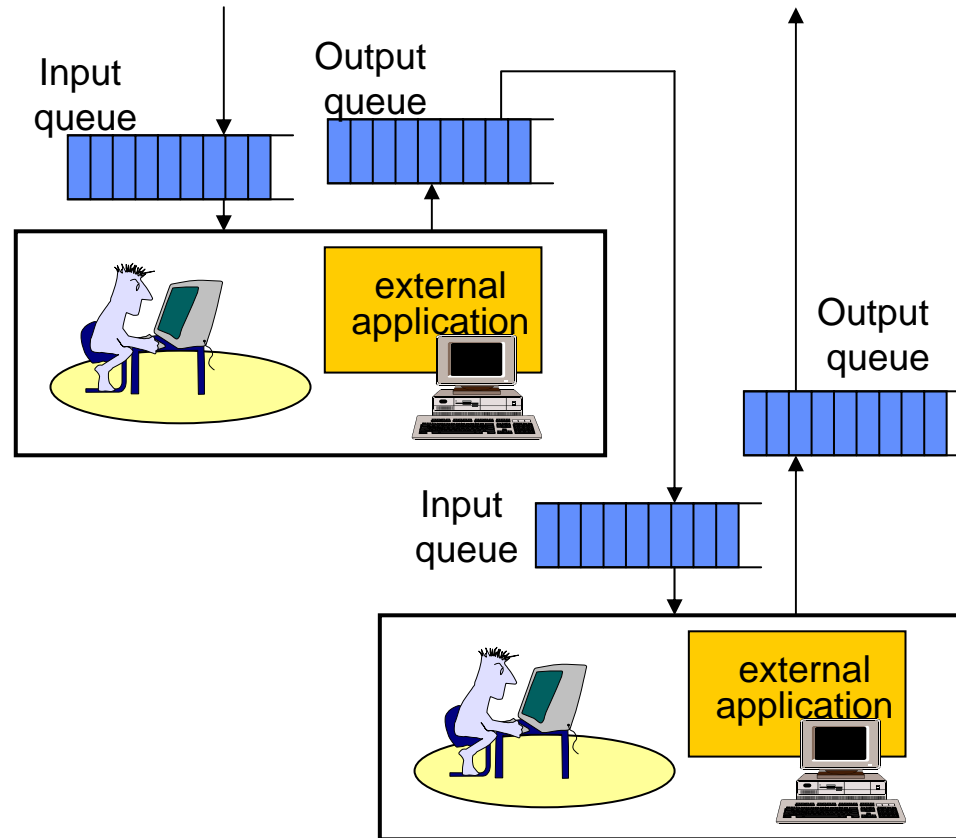


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Evolution of architectures

Message Oriented Middleware (MOM)

Simple Messaging: autonomous queuing

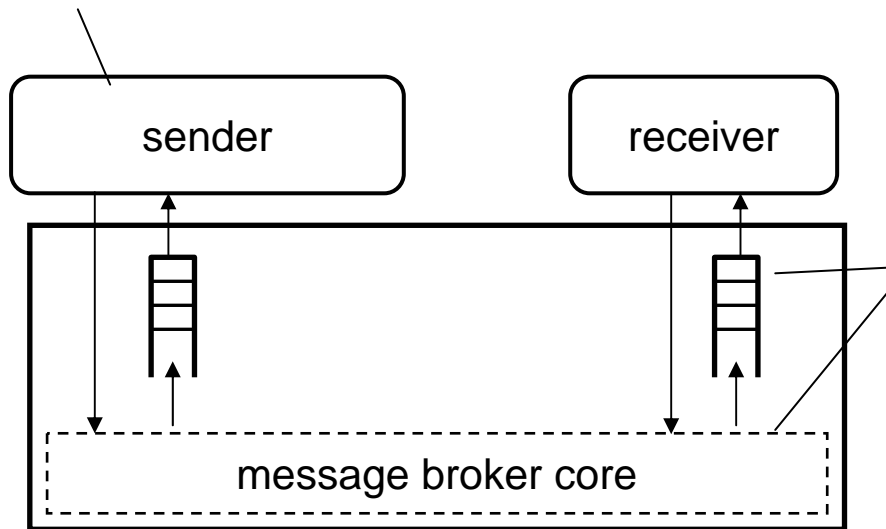


Evolution of architectures

Message Oriented Middleware (MOM)

Message brokering

In simple messaging it is the sender who specifies the identity of the receivers

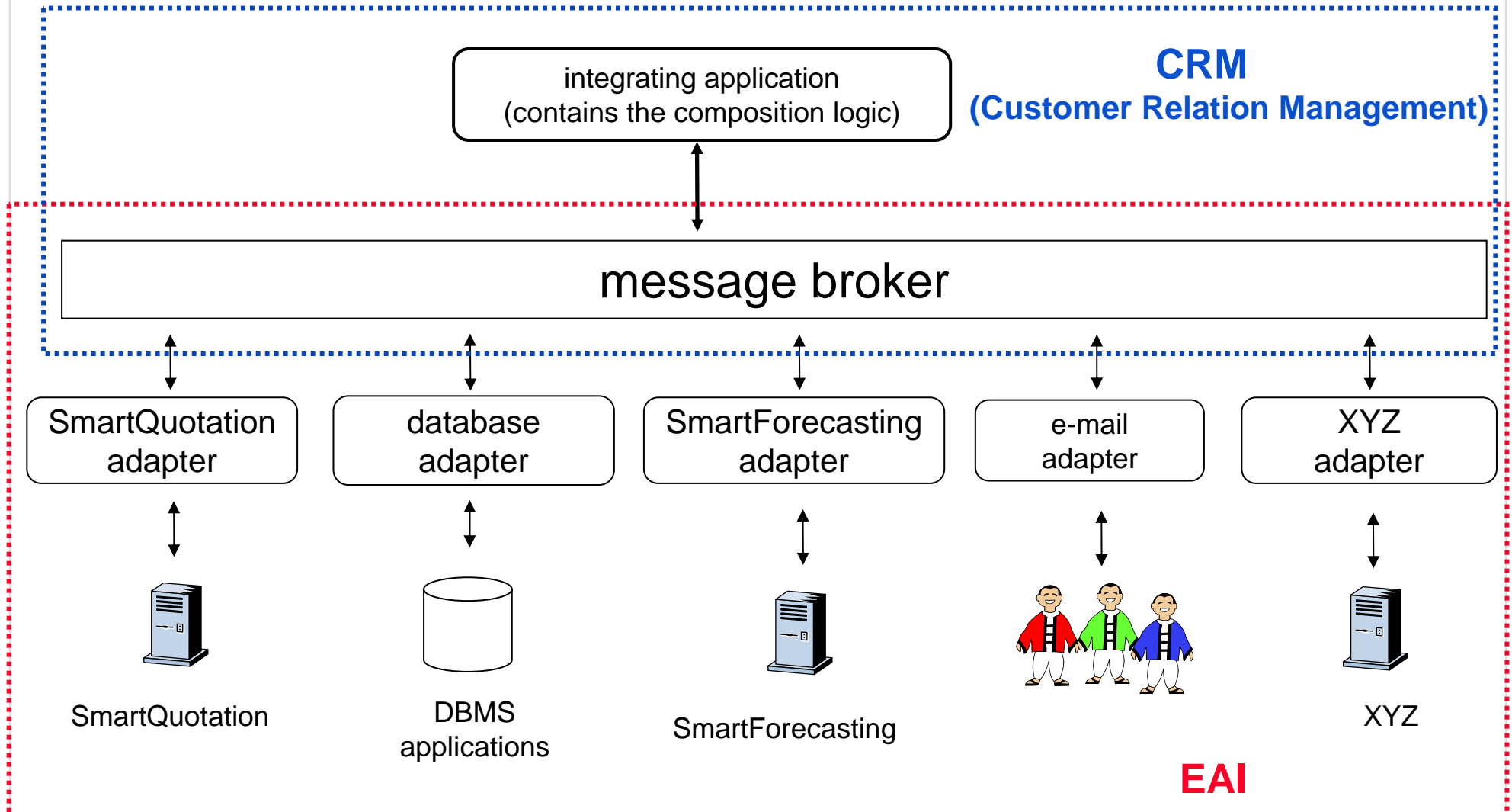


With message brokers, custom message routing logic can be defined at the message broker level or at the queue level

message broker

Evolution of architectures

MOM with Brokering = EAI (Enterprise Application Integration)



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Evolution of architectures

Enterprise Application Integration

Definition

Enterprise application integration (EAI) technology is the means of integrating existing software systems (legacy systems) within enterprises with each other in order to share data, replicate data or execution business processes involving many software systems

Evolution of architectures

Enterprise Application Integration

Requirements for the integration of legacy systems

- Access of the legacy systems themselves through adapters that understand the legacy systems' interfaces and can extract and insert data
- Data transformation to overcome data definition mismatches of legacy systems' interface data
- Business processes to define multi-step processes across several legacy systems in order to achieve a business goal (e.g., purchasing goods)

Requirements for EAI technology

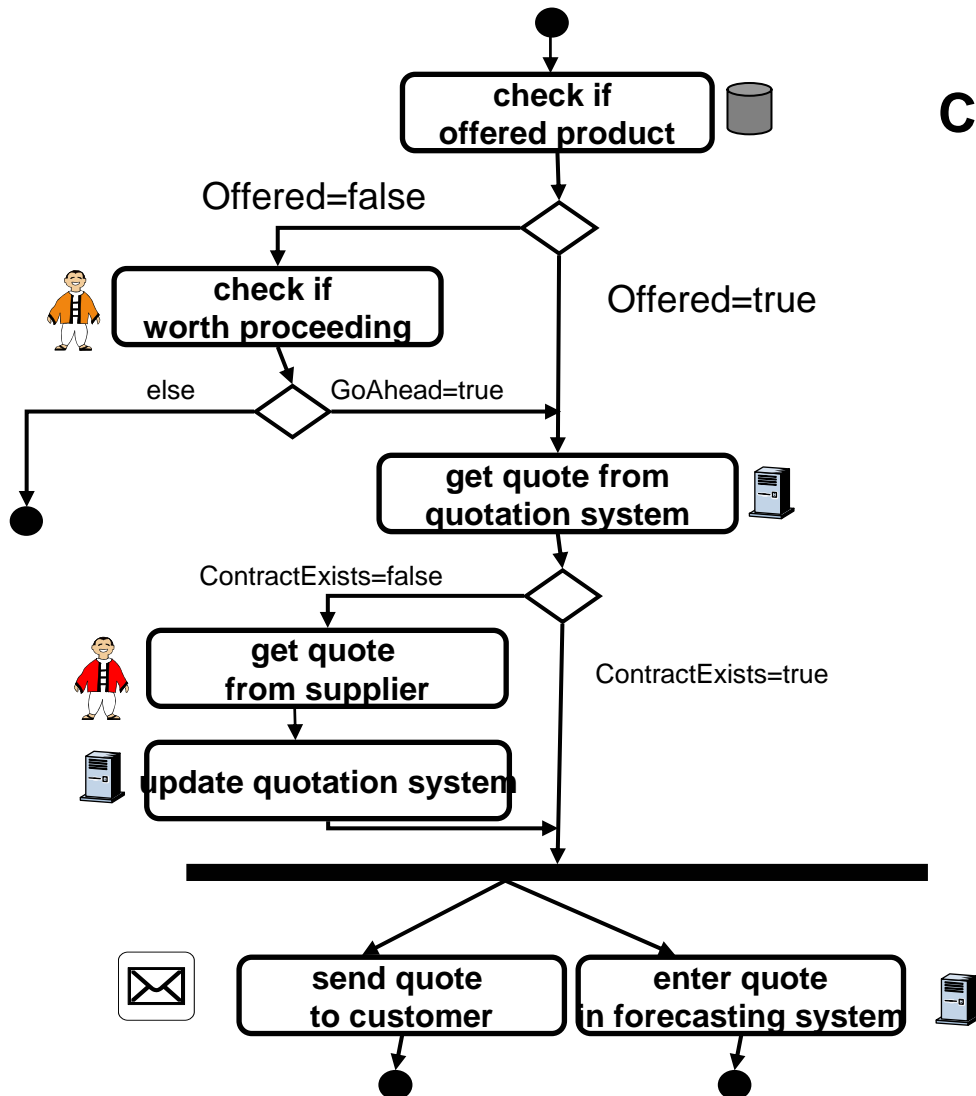
- Access as many legacy applications as necessary
- Define and execution as many business processes as necessary
- Transform data from any data type format to any other data type format

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Evolution of architectures

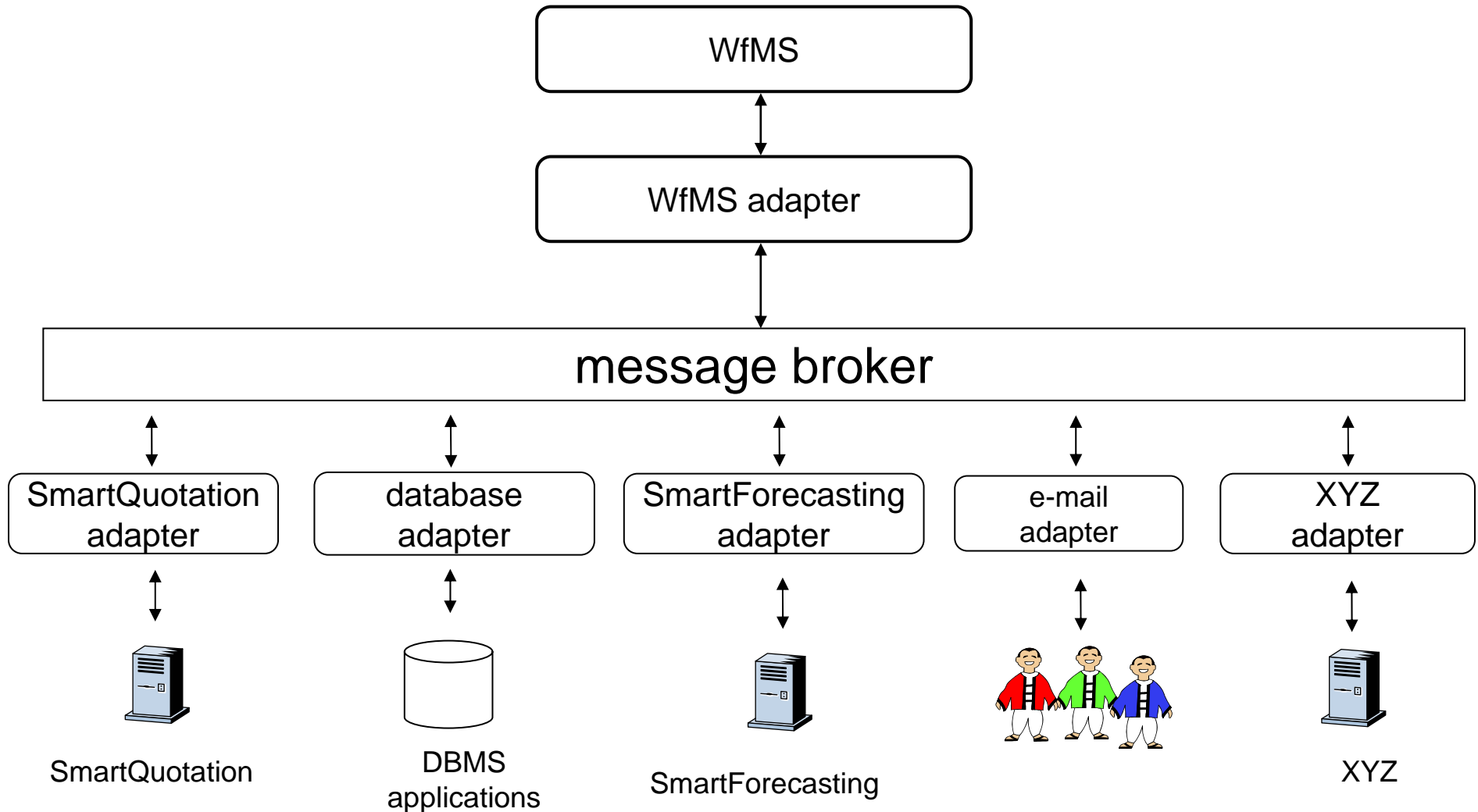
WFMS (Workflow Management System)

CRM for SCM (Supply Chain Management)



Evolution of architectures

Integrating WFMS and EAI



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Integrating SOA with WWW

WWW = client/server model as in RPC



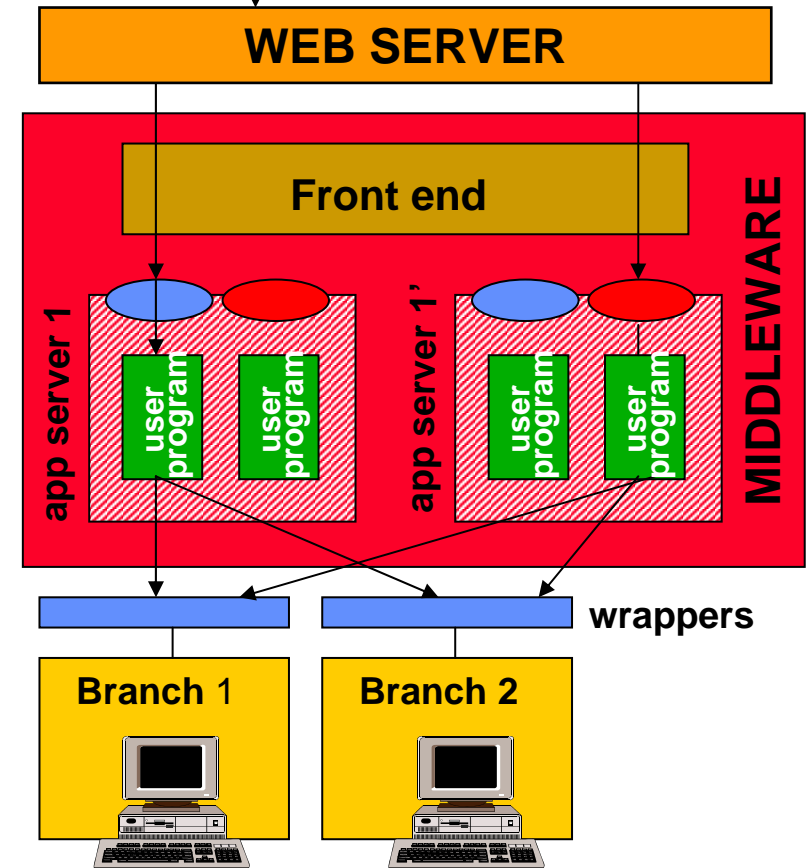
Browser

Special features of WWW:

- integration at the level of user interface became possible
- services could be accessed from anywhere in the world
- the clients could now be not just an internal or selected user but anybody with a browser

Consequences for WWW:

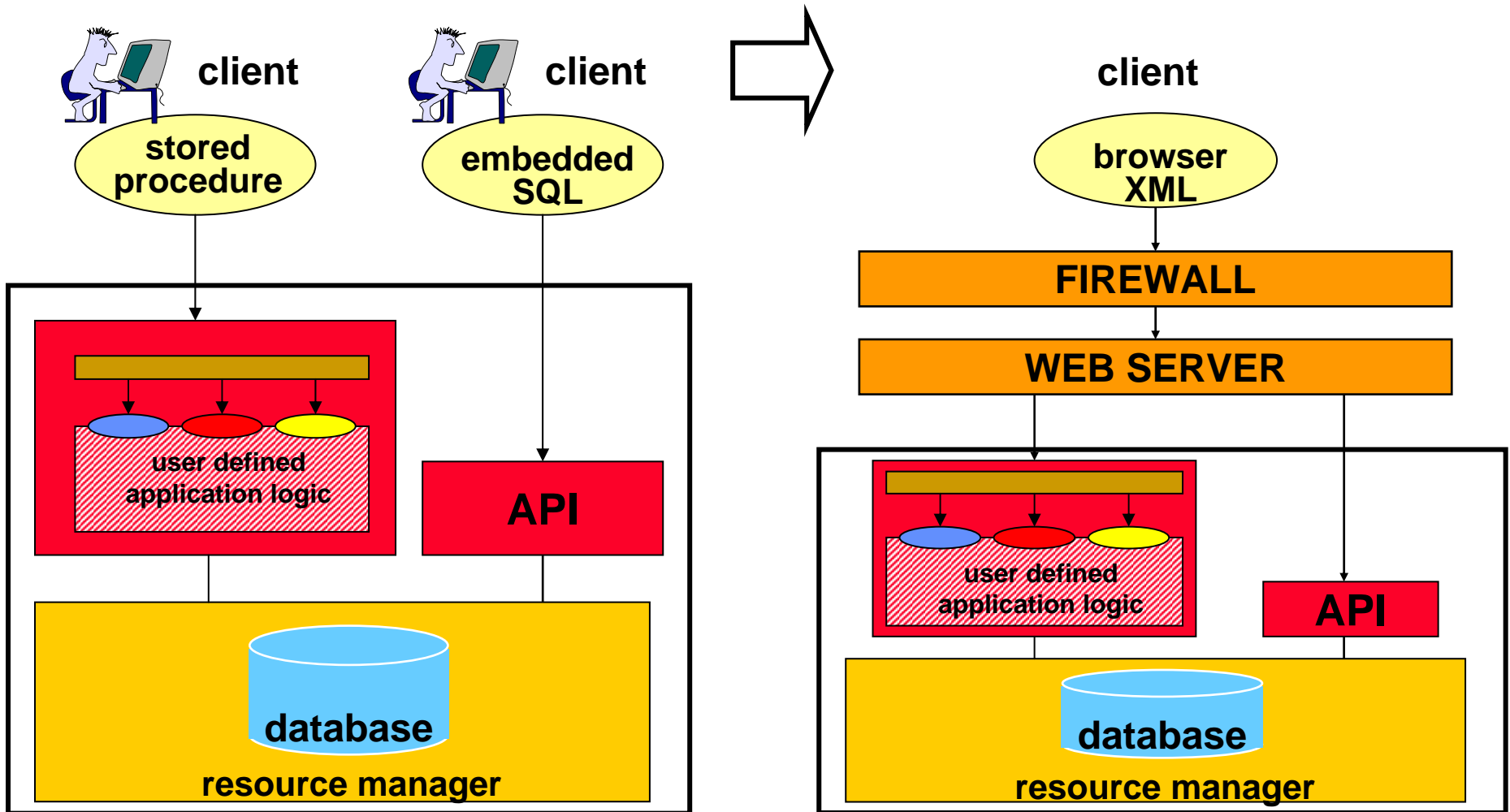
- easy
- cheap
- efficient



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Integrating SOA with WWW

Remote Clients



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Integrating SOA with WWW

B2C: Business-to-Consumer Integration

Definition

Business-to-consumer (B2C) integration is the means to have human users connect to businesses in order to purchase or to sell goods or services.

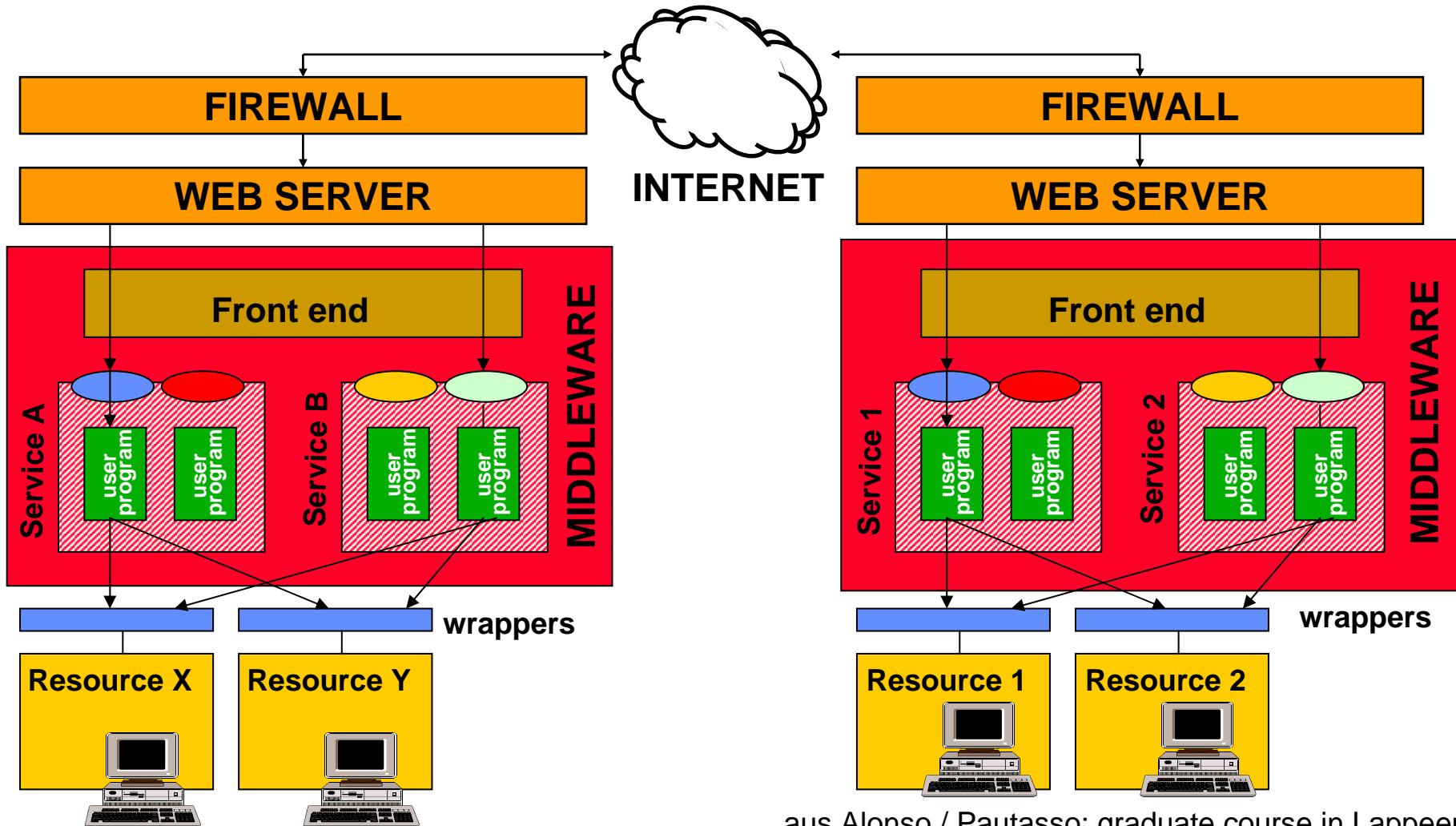
Requirements

- Dialog guidance of user for browsing goods and services, selection for purchase and the purchasing (“checkout”) itself
- Shopping cart management
- Security management
- User account management for customer to view and to track completed or ongoing orders
- Customer support for help or complaints and returns

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Integrating SOA with WWW

B2B: Business-to-Business Integration



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Integrating SOA with WWW

B2B: Business-to-Business Integration

Definition

Business-to-business (B2B) integration is the means to integrate the electronic data transmission between enterprises over public or private, secured or unsecured, transactional or unreliable networks.

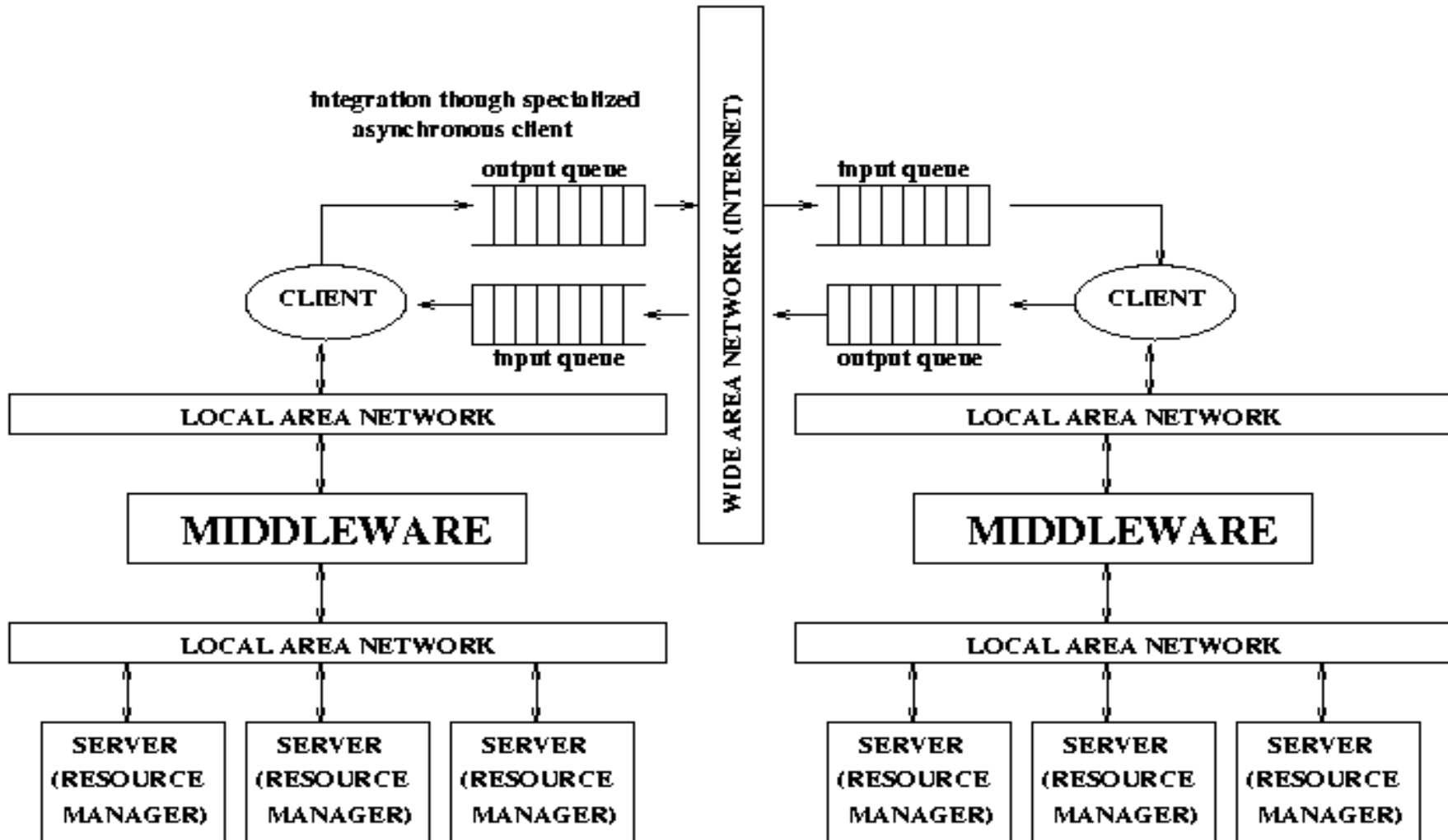
Requirements

- Support of any data type format required by the communicating enterprises.
- Agreement on a common data type format for the messages between the communicating enterprises
- Support of data transformation in order to overcome data type format heterogeneity
- Security support in order to address unsecured and unreliable networks
- Contract management in order to define legally sanctioned communication
- Non-repudiation support in order to prove that messages were communicated as stated
- Conversations in order to define the ordered message exchange

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Integrating SOA with WWW

The Message World



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Integrating SOA with WWW

Documents vs. Methods

The opposing paradigms

- Contents and interpretations vs. sending and receiving
- Business processes instead of functions

Example: Ordering goods

- Order response document
- Change Order document
- Cancellation Order document

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Business Processes in SOA

Business Logic

Definition

Business logic is the sequence of business functions that are necessary to achieve a value-added business goal (“business process”)

Example: Purchase of Goods

- Good selection
- Request for quotation
- Purchasing
- Payment

Business Processes in SOA

Business Logic Composition

Definition

Business Logic Composition is the construction of business processes out of smaller business processes that are self-contained and can be combined into a more complex business process that implements the complete business logic.

Business logic composition involves:

- Definition of control flow between the parts
- Definition of data flow between the parts
- Definition of compensation to account for errors and cancellations

Business Processes in SOA

Development of standards

- EDI (Electronic Data Interchange)
- Additional standards (EDIFACT, X12) for transactions
- ebXML (electronic business XML)
- BPEL (Business Processing Execution Language)
- BPEL4WS

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