AASE 4

Enterprise Application Integration & SOA

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Outline

- EAI Overview
- SOA Overview

Enterprise Application Integration

- When systems are very **different** in nature and functionality, using conventional middleware to integrate them:
  - **more difficult**, in some cases simply **infeasible**.

- EAI can be seen as a step **forward** in the **evolution of middleware**, extending its capabilities to combine with application integration…

Conventional Middleware

- Conventional middleware was used to **create applications on top of a heterogeneous set of resources** (e.g. databases)
  - developers focused on **creating application logic**
    - To prepare information in **presentation layer**
  - this process was aided by various **standardization** efforts
    - e.g. JDBC, ODBC, ADO for databases,

EAI

- Enterprise application integration is how to **integrating services** hosted by a **heterogeneous** set of **middleware** platforms, often owned and operated by **different parts** of the **same** companies, or by **different** companies **altogether**
  - It includes:
    - Business Process Integration
    - Enterprise Information Integration

EAI

- EAI is the use of **software** and **computer systems architectural principles** to **integrate** a set of enterprise computer applications
- EAI is the "**sharing** of data and business processes among any connected application or data sources in the enterprise."
  - Using Service Oriented Architectures

EAI

- **Integrates** applications and enterprise data sources so that they can easily share business processes and data
- Integration is **done without significant changes** of applications and data sources

Challenges of EAI

- One large challenge of EAI is that the **various systems** to be linked together
  - different operating systems,
  - use different database solutions and
  - different computer languages, and
  - legacy systems that are no longer supported by the vendor who originally created them.

EAI Level

- **Data Level Integration**
  - Occurs at **database** level within an enterprise.
  - By **migrating** data from on source to another.
  - Move data between applications but it needs application logic **unchanged**.
  - Ex: JDBC, ODBC
- **API Level Integration**
  - Applications are bound together using their **APIs**.
  - Depends on **how feature-rich** an interface is.
  - This type of EAI is mostly applicable for **ERP** applications like SAP, Oracle, PeopleSoft, etc

EAI Level

- **Method Level Integration**
  - Achieved by **sharing the business logic** within the enterprise.
  - Requires **major changes** in source code (in method/function)
  - **Distributed objects** can be used.
    - Ex: CORBA, RMI, .NET Remoting
- **User-Interface Level Integration**
  - Integrate applications using their **user-interface** as a common point.
    - Ex: **mainframe** applications that do not have database or business process-level access may be accessed through the user interface of the application
  - *Not a preferred one*, but in some cases the **only way** of approaching the task.
  - Mostly used for legacy applications / external systems.

EAI Architecture

- EAI platforms are based on two basic principles:
  - **Adapters**: programs that **map** heterogeneous data formats, interfaces, and protocols into a common model and format.
    - The purpose of adapters is to **hide heterogeneity**;
    - **a different adapter** is needed for each type of application that needs to be integrated.
    - Using **adapter pattern**
  - **Message Broker**: the message broker **facilitates** the **interaction** among adapters and a program that contains the **integration logic**
    - Using messages exchange protocol

EAI's purposes

- **Data (information) Integration**: ensuring that information in multiple systems is kept *consistent*.
- **Process Integration**: *linking* business processes across applications.
- **Vendor independence**: extracting *business policies* or rules from applications and implementing them in the EAI system, so that even if one of the business applications is replaced with a different vendor's application, the business rules *do not have to be re-implemented.*
- **Common Front End**: an EAI system could *front-end* a cluster of applications, providing a *single consistent* access interface to these applications and shielding users from having to learn to interact with different software packages.

Examples of **Applicable Standards** to support EAI

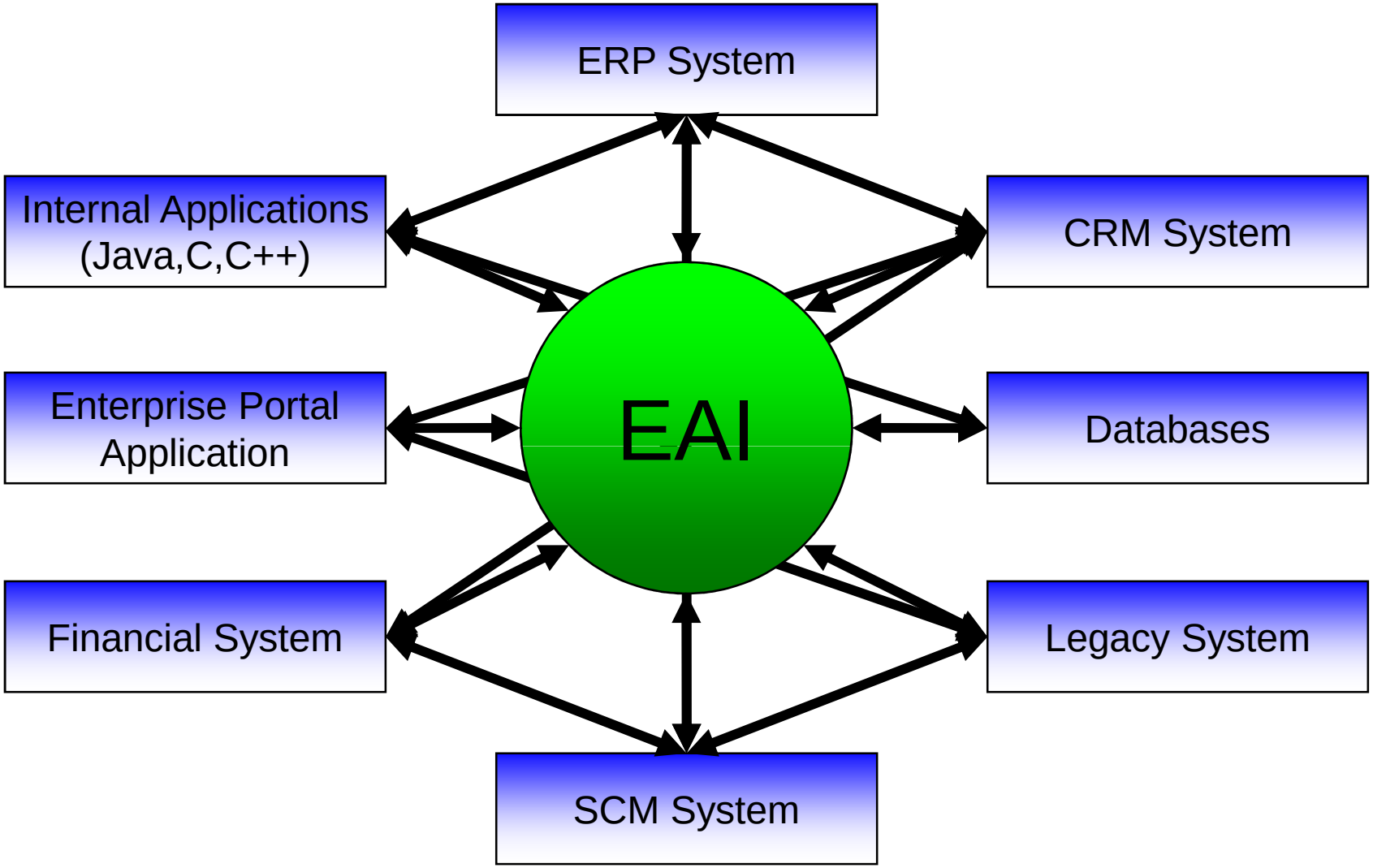
- **Earlier middleware:** RPC, Transaction Monitor
- **Object Broker:** CORBA, RMI
- **Communication**: Messaging / JMS
- **Connectivity**: Web Services-> XML, SOAP, WSDL, UDDI
- **Transformation** Standard: XSLT, XQuery
- **Portability**: Java, HTTP, XML, SOAP on Windows, Unix, mainframes
- **Security**: SSL, certificates, signatures, dan WS-* security standard

EAI standards implementation technologies

- **Rosettanet**
  - A non profit organization
  - Group included American Express, Microsoft, Netscape, IBM
  - Implements Standards for **supply chain transactions**
- **UCCNET**
  - Non profit subsidiary of the Uniform Code Council
  - Internet based **Supply Chain Management**
  - Supported by Wal-Mart, Shaw's, Home Depot
- **BPEL4WS**
  - **Web service** orchestration language
  - Standard process integration language
  - Successor to IBM’s WSDL and Microsoft’s XLANG

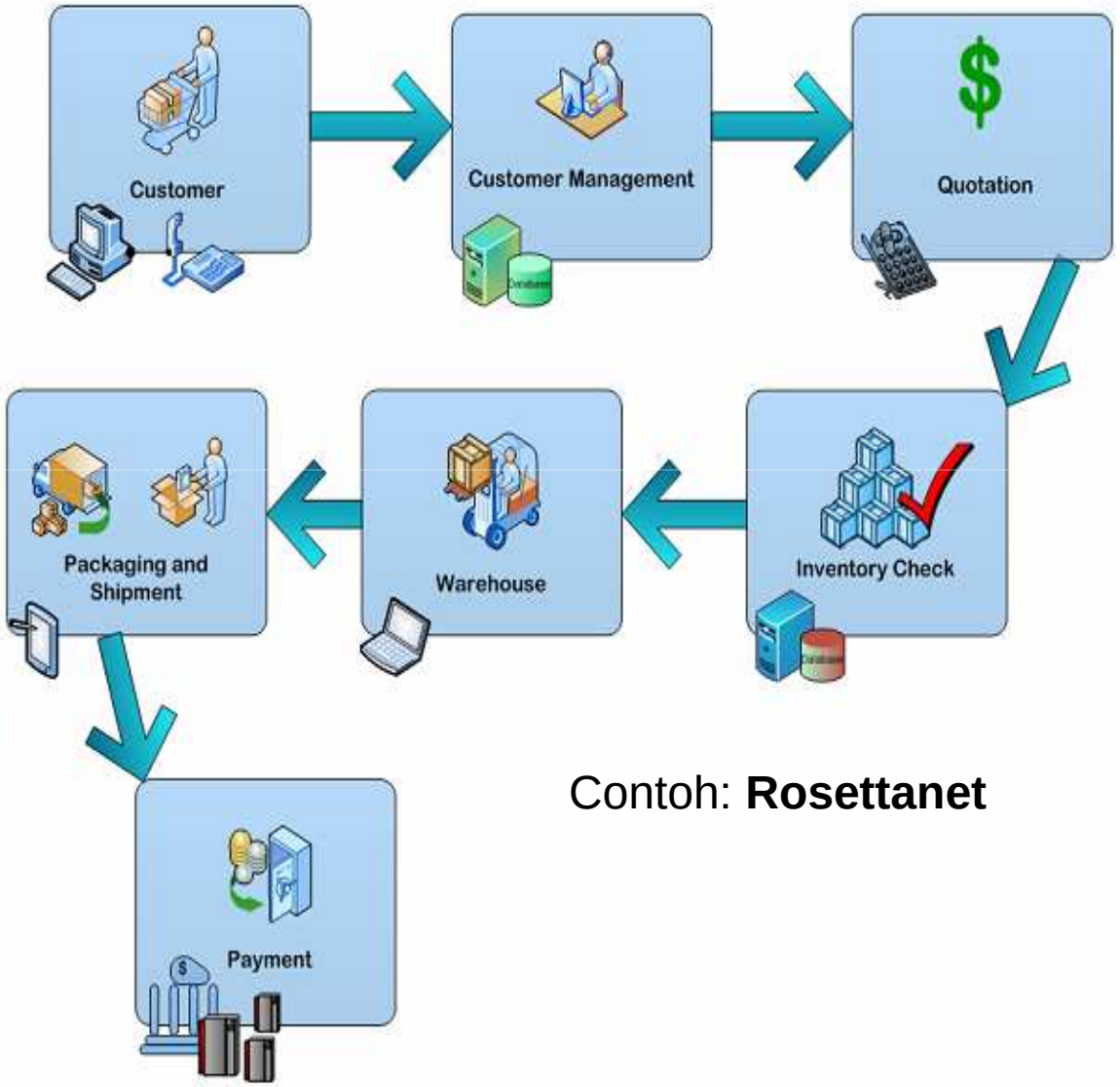
EAI Vendors

- IBM - WebSphere Application Server
  - Provides support for deploying an application, managing resource requirements for applications
- SAP NetWeaver™
  - Unifies integration technologies into a single platform, pre-integrated with business applications
- BEA System -WebLogic Integration™
  - Weblogic Integration™ is process integration module of BEA's WebLogic Enterprise Platform™
- TIBCO - Business Works™
- Microsoft BizTalk


ERP System
Internal Applications
(Java,C,C++)
CRM System
EAI
Enterprise Portal
Application
Databases
Financial System
Legacy System
SCM System

EAI diterapkan misal pada Supply Chain

- The process of fulfilling a customer order involving many departments, external suppliers, warehouses, manufacturing sites, etc.



Contoh: **Rosettanet**

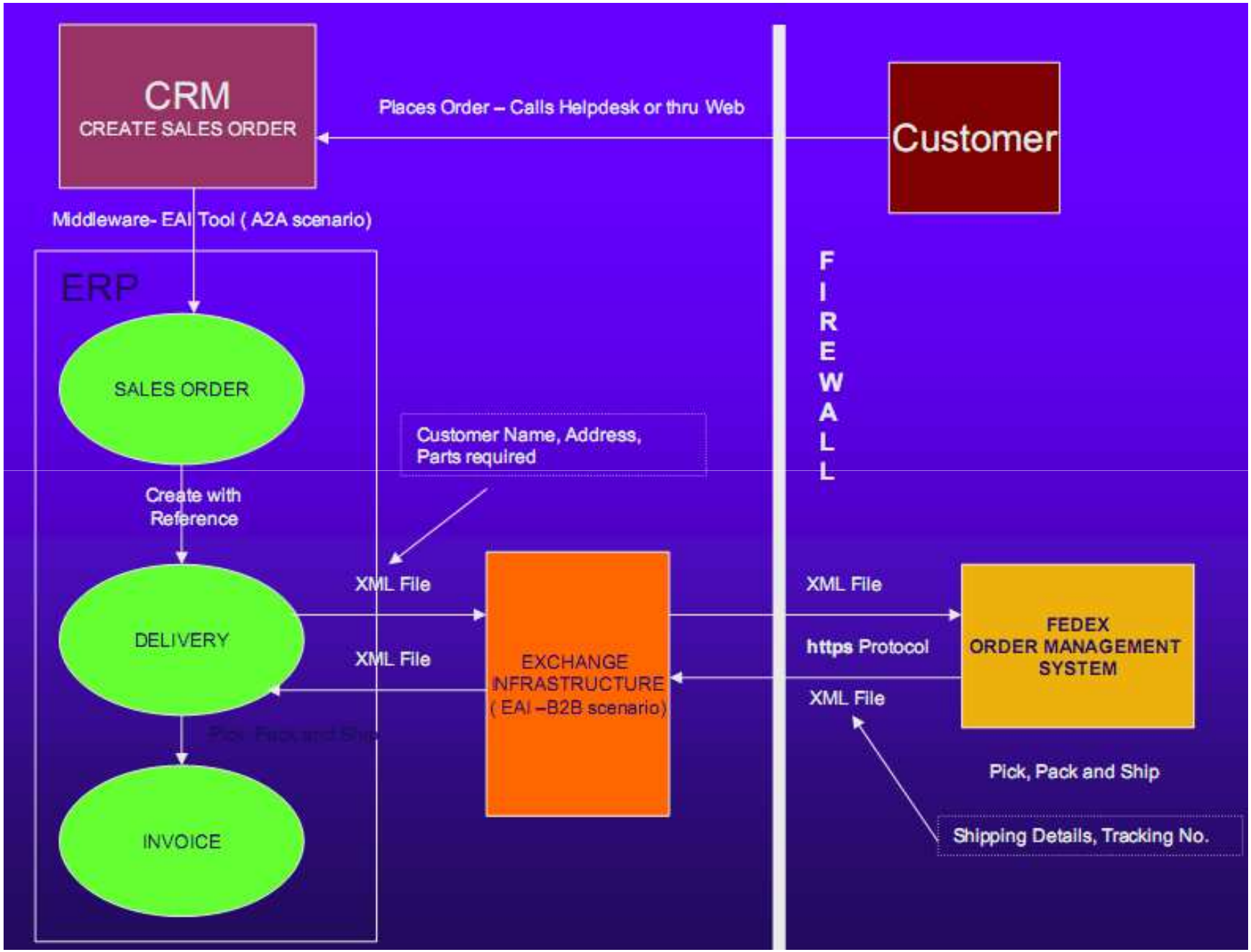
Example scenario

Business Scenario

- Capital Equipment Manufacturing Company
- Servicing Hospitals with 9 Warehouses ($30 Million Inventory) owned and operated in North America
- Customer Satisfaction is critical. Need to ship Services parts in time quickly
- Expensive to maintain 9 Warehouses

Proposed Solution

- All 9 warehouses being outsourced to major Shipping Company – FEDEX-KINKOS
- Need to Integrate with FedEx's System for this outsourcing agreement


CRM
CREATE SALES ORDER
Places Order – Calls Helpdesk or thru Web
Customer
Middleware- EAI Tool (A2A scenario)
ERP
SALES ORDER
FIREWALL
Customer Name, Address,
Parts required
Create with
Reference
XML File
XML File
DELIVERY
EXCHANGE
INFRASTRUCTURE
(EAI –B2B scenario)
XML File
https Protocol
XML File
FEDEX
ORDER MANAGEMENT
SYSTEM
Pick, Pack and Ship
INVOICE
Shipping Details, Tracking No.


S
O
A

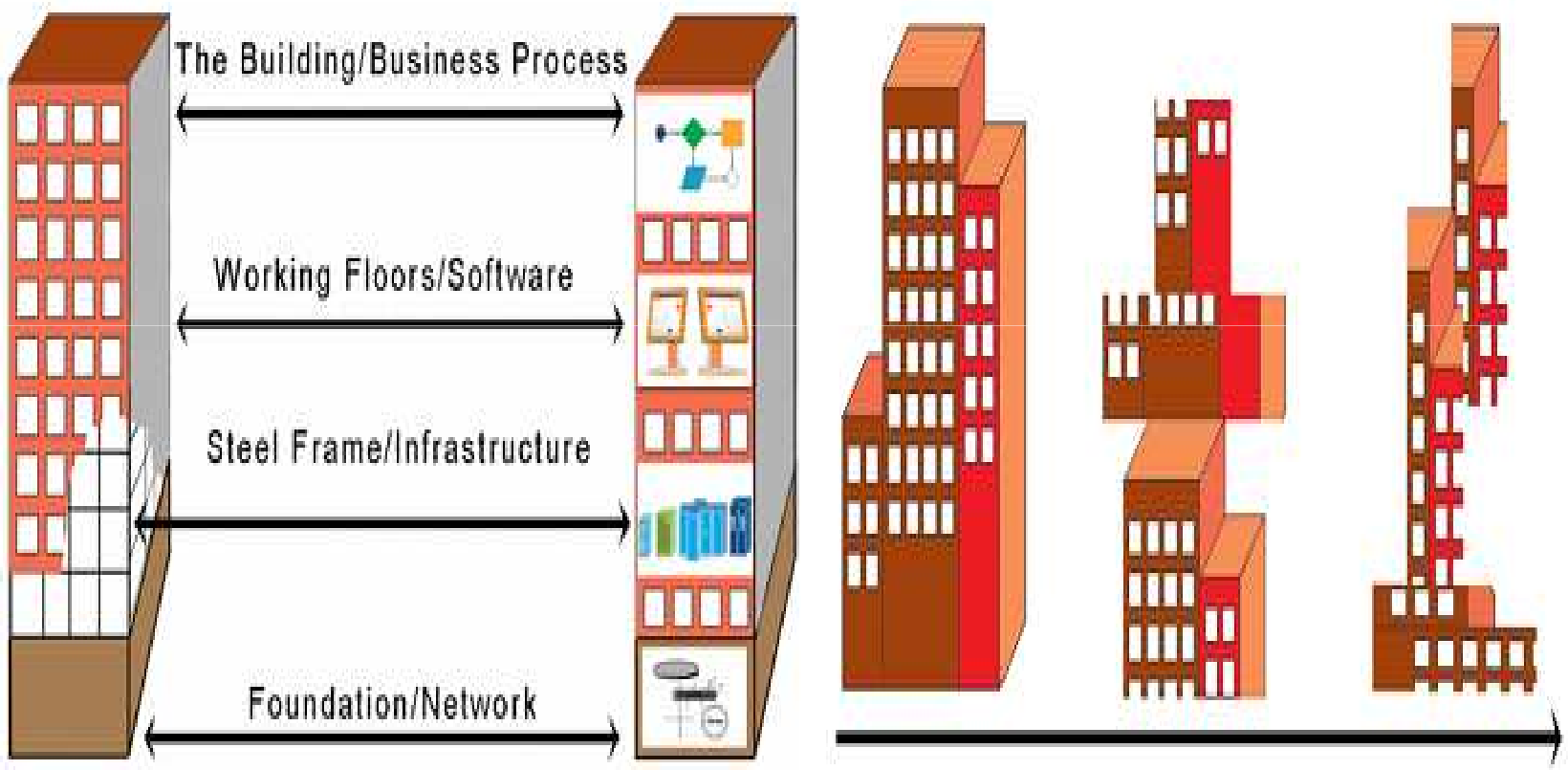
Service Oriented Architecture

- SOA adalah sebuah konsep Software Architecture yang mendefinisikan penggunaan **layanan** untuk mendukung kebutuhan pengguna software.
  - Salah satu bentuk model implementasi EAI
- A service-oriented architecture is a framework for **integrating business processes** and supporting IT infrastructure as secure, standardized components—**services**—that can be **reused** and **combined** to address changing business priorities

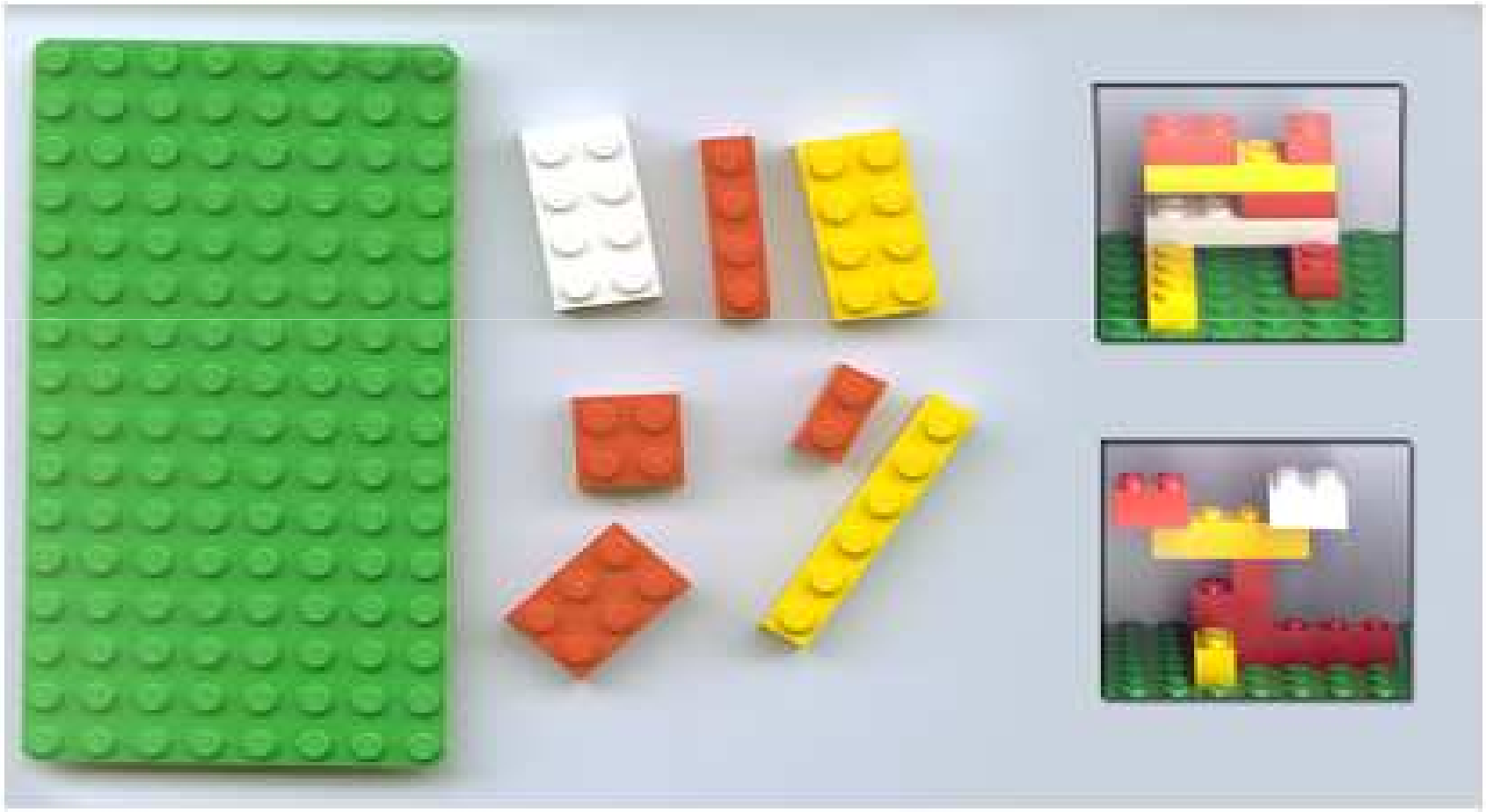
Apakah SOA ?

- SOA adalah sebuah arsitektur yang merepresentasikan fungsi dalam bentuk layanan
  - Mengapa **fungsi**?
    - Karena fungsi menunjukkan **abstraksi aktivitas** – sesuatu yang secara alami dilakukan oleh aplikasi/program, individu, dan organisasi
  - Mengapa **layanan**?
    - Karena layanan mengabstraksikan fungsi dan dapat menunjukkan bentuk **hubungan** yang bermakna antara 2 pihak yang berkomunikasi (requester dan provider)

Architecture Analogy



SOA's architecture



SOA dan Aplikasinya

- Ada dua arah pengembangan:
  - Inward → ke dalam institusi sendiri → integrasi sistem-sistem yang ada untuk membangun fungsionalitas yang lebih luas
    - Misal : untuk Supply Chain Management
  - Outward → memanfaatkannya sebagai perluasan sistem yang ada (external network, peluang bisnis, dsb)
    - Contoh: layanan pembuatan file PDF secara online (mis: www.pdfonline.com)

Penyebab SOA dan Tujuan SOA

- Pendorong berkembangnya SOA dari sisi bisnis:
  - Large scale **Enterprise** systems
  - **Internet** scale provisioning of services
  - Want to **reduce** the cost of doing business
- Tujuan
  - Implementation **transparency** (common structure, neutral service description)
  - Location **transparency** (no hard binding)

SOA dan Integrasi Aplikasi/Sistem

- SOA sebagai **platform integrasi**:
  - SOA memisahkan antara **pesan/query/call** dengan **pemrosesan**
  - Pesan/query/call **distandardisasi** dan tidak dikaitkan dengan sebuah produk teknologi tertentu, sehingga bisa dikirimkan/diterima oleh siapapun
  - SOA memisahkan antara bagian **publik** dan bagian **privat**
    - Bagian **publik** dapat diakses oleh siapapun, berupa deskripsi tentang layanan yang ditawarkan
    - Bagian **privat** hanya bisa diakses oleh pemilik/penyedia layanan

Komponen SOA

- Layanan / Service
- Penyedia layanan / Provider
- Pemakai layanan / Consumer / Requester
- Tempat penyimpanan / Registry
- Pesan / query / call

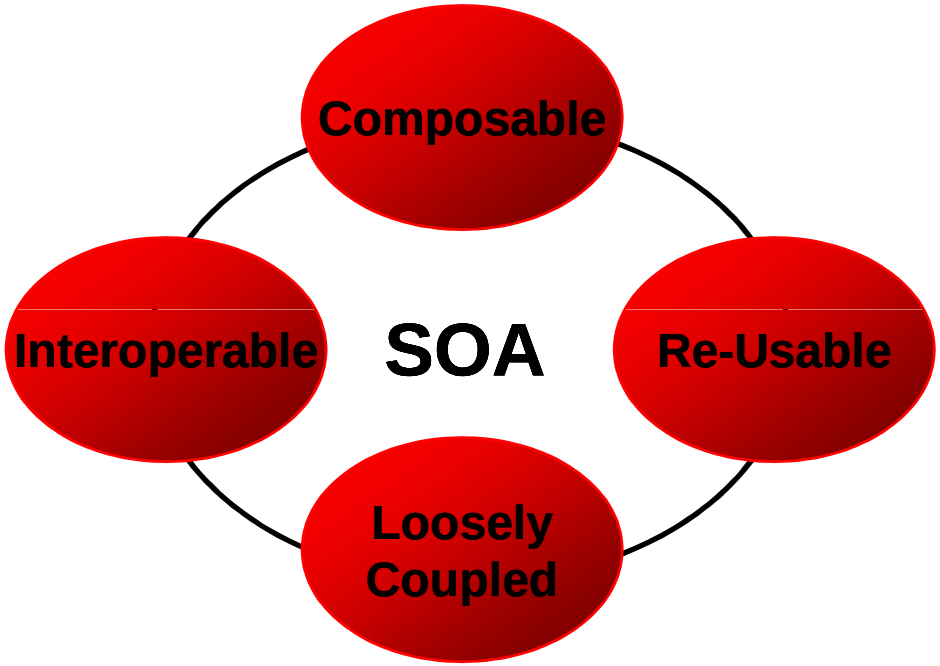
Sifat SOA

- SOA bersifat **behind the scence**,
  - SOA tidak terlihat secara langsung oleh client, SOA dihadapkan pada client melalui client UI.

- SOA merupakan suatu service yang “hanya menunggu” (**listen**) secara terus-menerus untuk digunakan.

Characteristics of SOA

- Services have **platform independent**, self describing interfaces (XML)
- Messages are **formally defined**
- Services **can be discovered**
- Services have **quality of service characteristics** defined in policies
- Services can be **provided on any platform**



Beberapa Istilah dalam SOA

- **Service**: suatu fungsi yang menerima satu atau lebih request dan mengembalikan satu atau lebih response yang terdefinisi dengan baik dengan menggunakan interface yang standar.
  - Service is **self-contained**. That is, the service maintains its own state
  - Interface contract to the service is **platform-independent**
  - Service can be **dynamically located and invoked**
  - Pengguna service **dapat menentukan** service yang diperoleh untuk digunakan dalam application logic mereka.
- **Stateless**: tidak menyimpan kondisi apapun.

Beberapa Istilah SOA

- **Provider**: host / application logic yang menyediakan service dan meresponse sebuah request.
- **Consumer**: host yang membutuhkan response dari service yang dihasilkan oleh provider.
- **Binding**: Hubungan antara provider dan consumer bersifat dinamis dan hubungan itu dibuat pada saat runtime berdasarkan mekanisme binding.

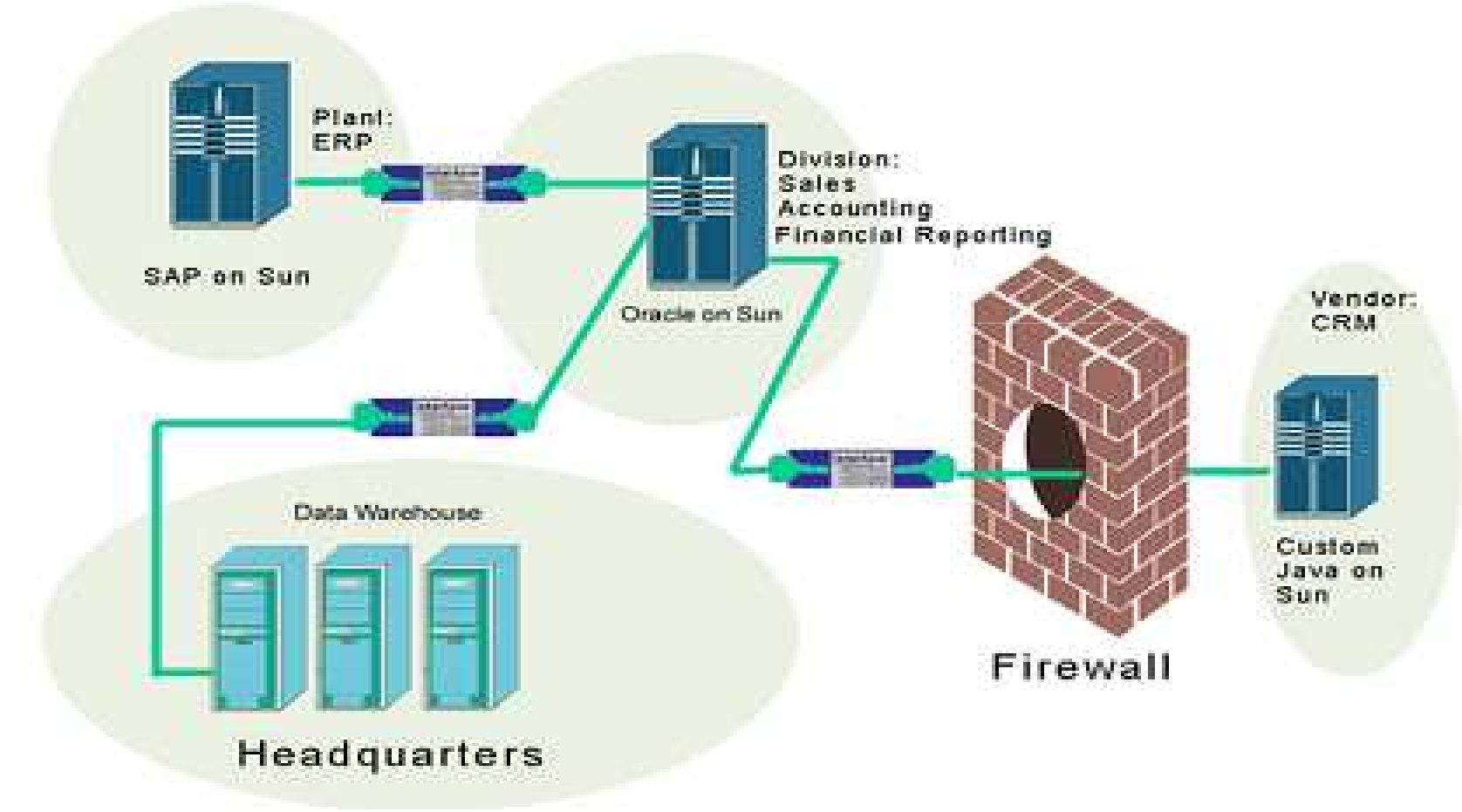
Benefits of SOA

- **Better reuse of services**
  - Build new client functionality on top of existing Business Services
- **Well defined interfaces**
  - Make changes without affecting clients
- **Easier to maintain**
  - Changes/Versions are ok!
- **Platform Independence**
  - An enterprise can leverage its existing legacy applications that reside on different types of servers

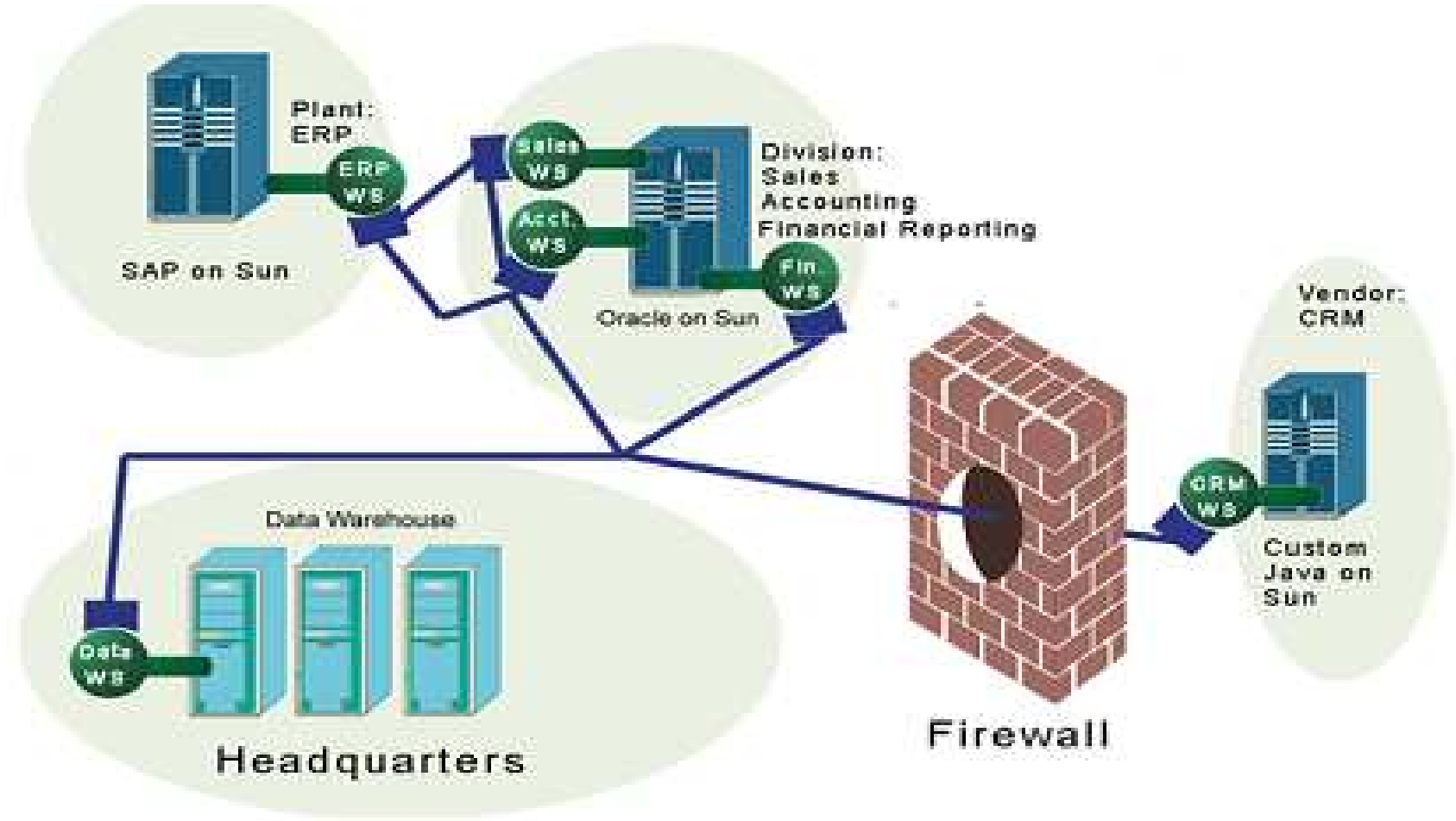
Benefits of SOA (2)

- **Code Reuse**
  - the services can be **reused** in multiple applications
- **Location Transparency**
  - Web services are often published to a directory where consumers can look them up
- **Better scalability**
  - there can be **multiple** instances of the service running on different servers. This increases scalability
- **Higher availability**
  - Since the location of a service does not matter and you can have multiple instances of a service, it is possible to ensure high availability

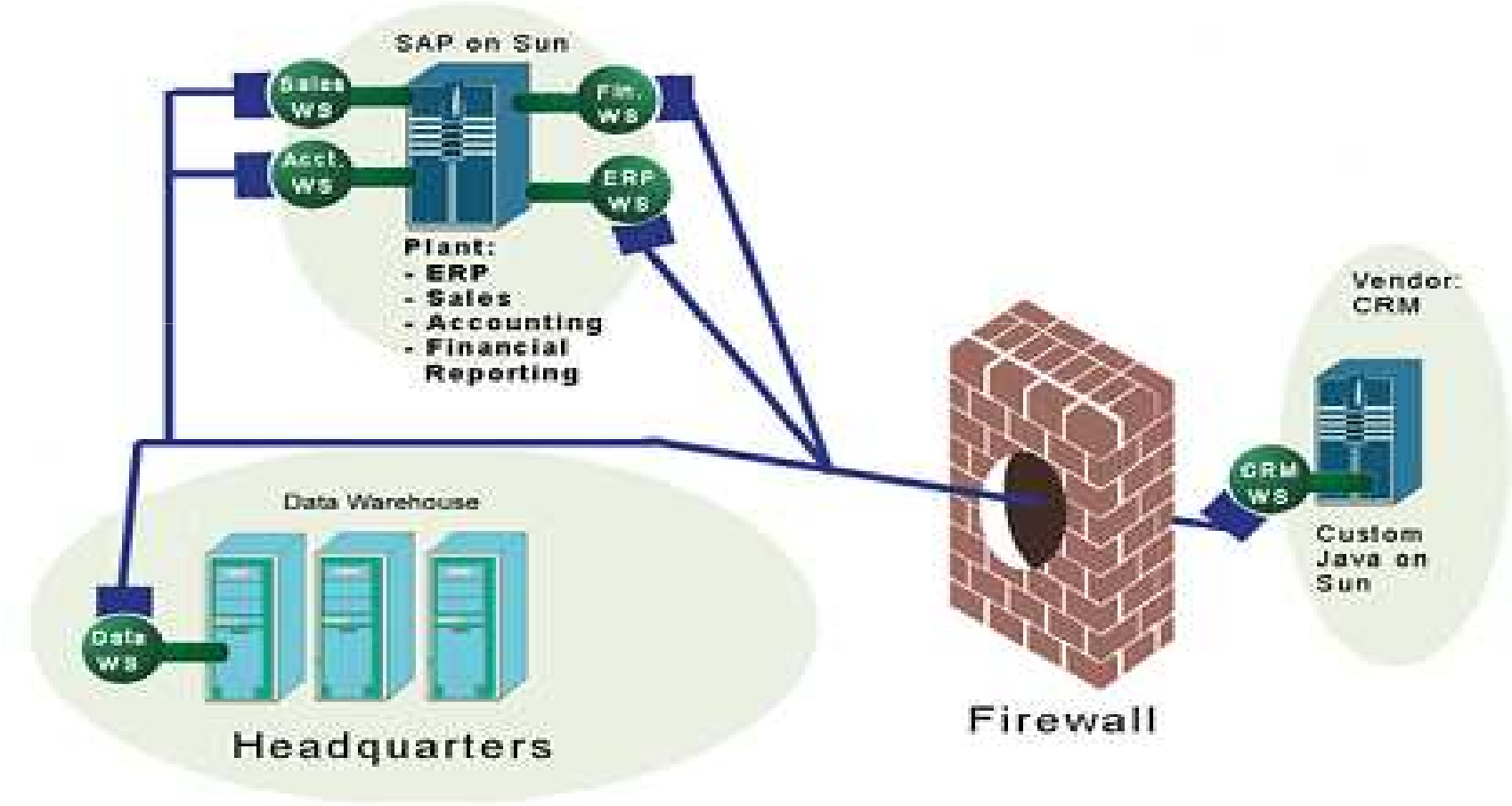
Non-SOA


Plant:
ERP
SAP on Sun
Division:
Sales
Accounting
Financial Reporting
Oracle on Sun
Vendor:
CRM
Custom
Java on
Sun
Data Warehouse
Headquarters
Firewall

SOA – Web Services



Changing SOA

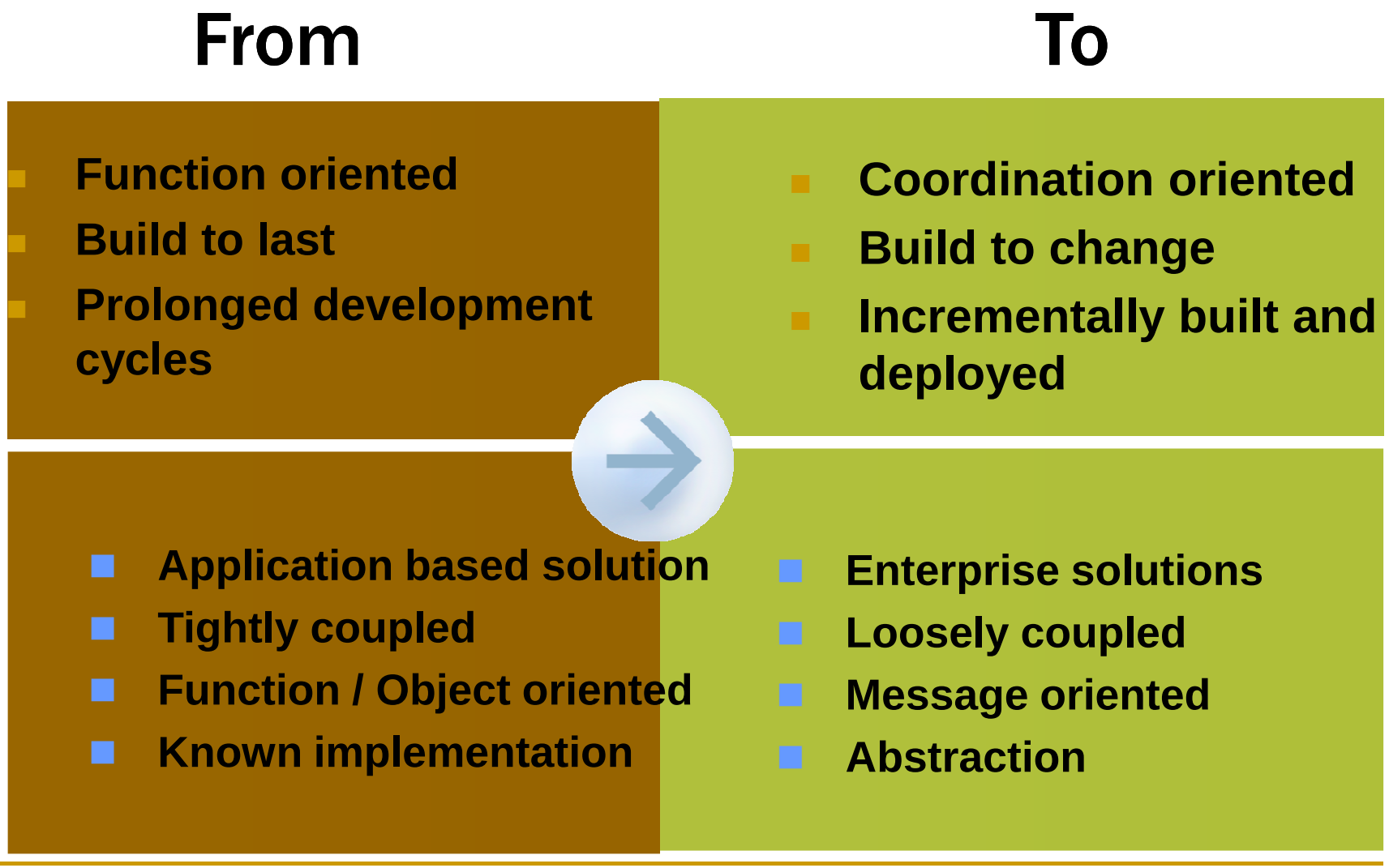


From Components to (Web) Services

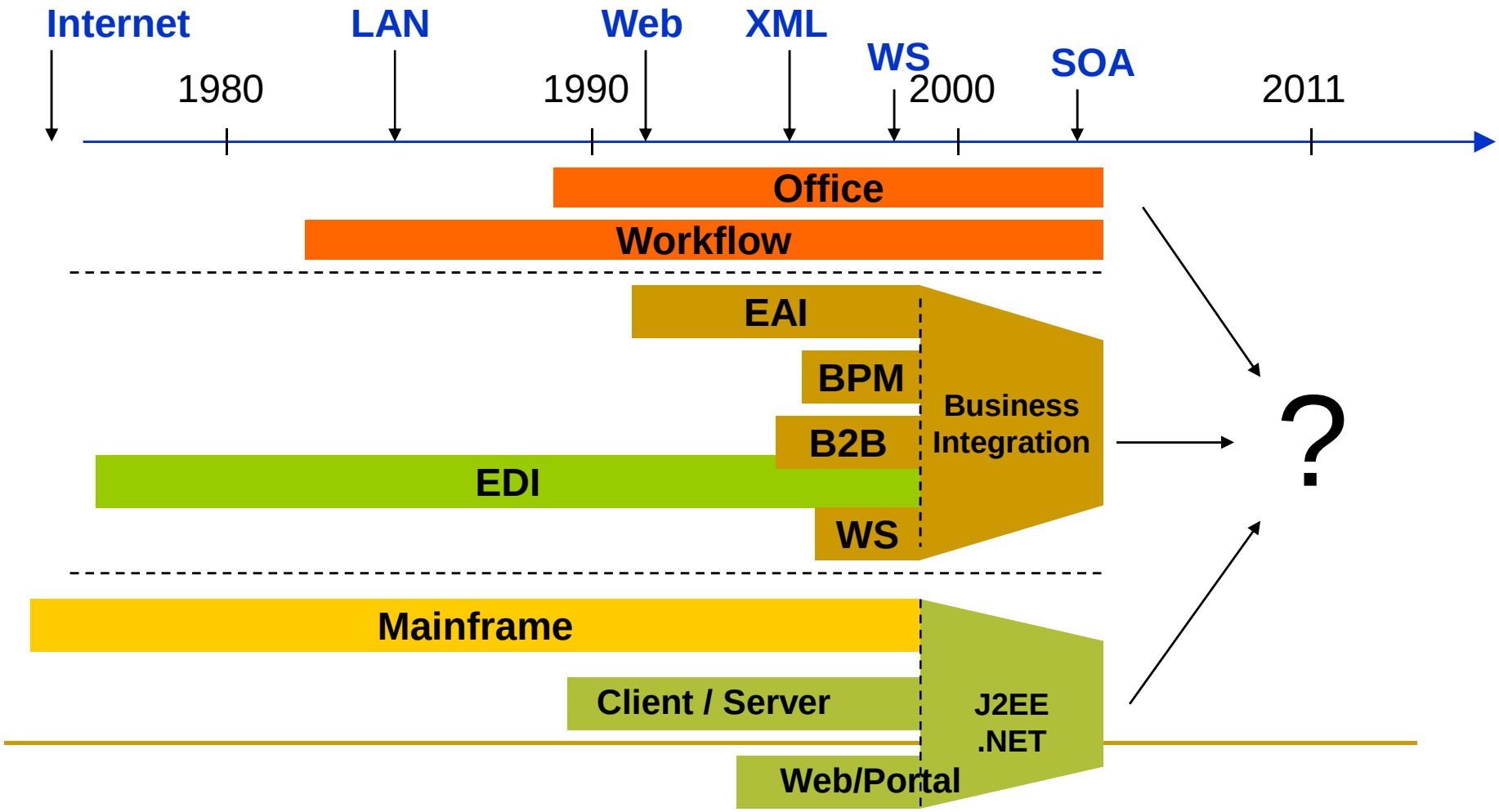
- Requires a client library
- Extendable
- Stateless
- Fast

- Loose coupling via
  - Message exchanges
- Composable
- Stateless & Context independent
- Some overhead

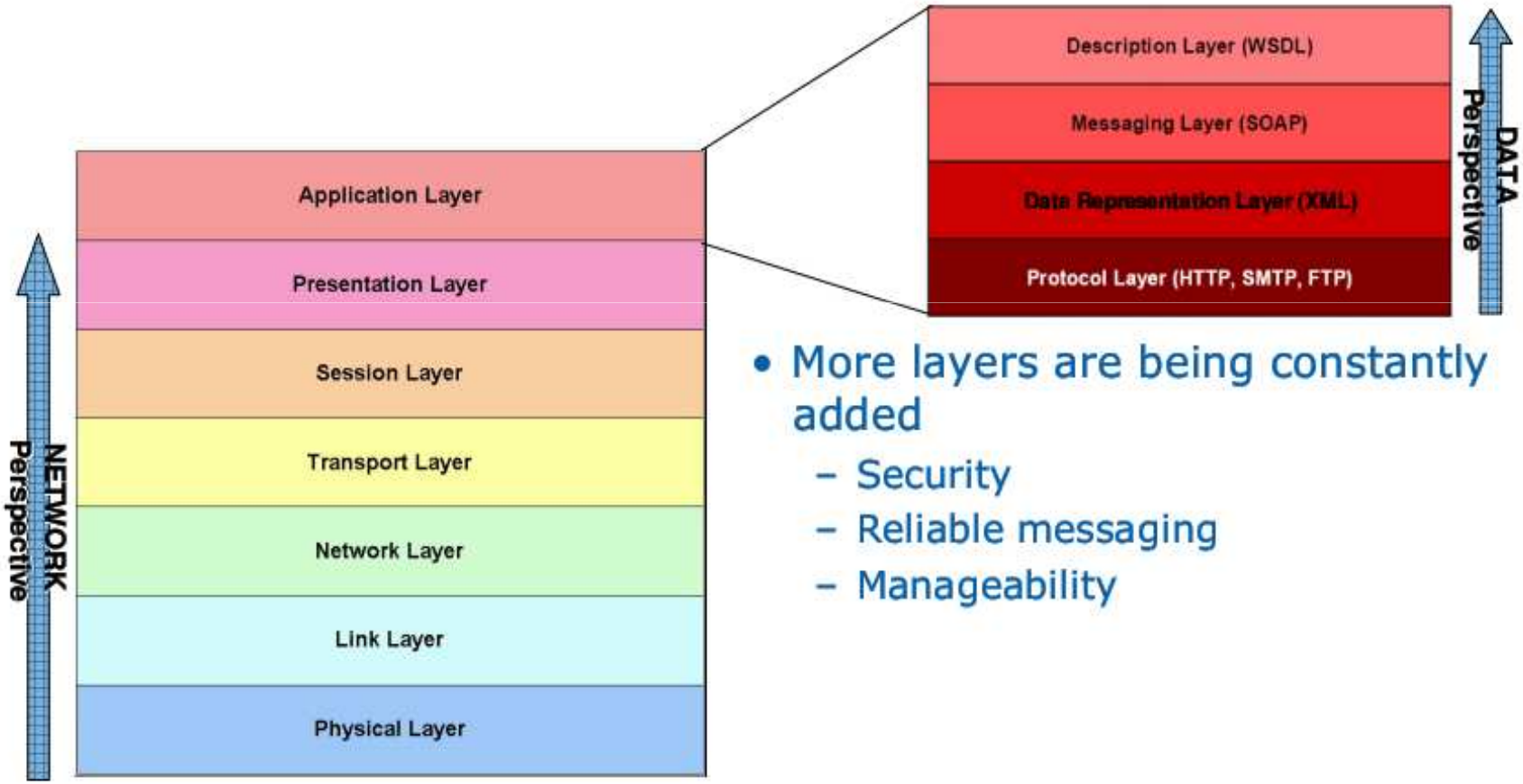
Shift From Application To A Service-Oriented Architecture



Perkembangan SOA



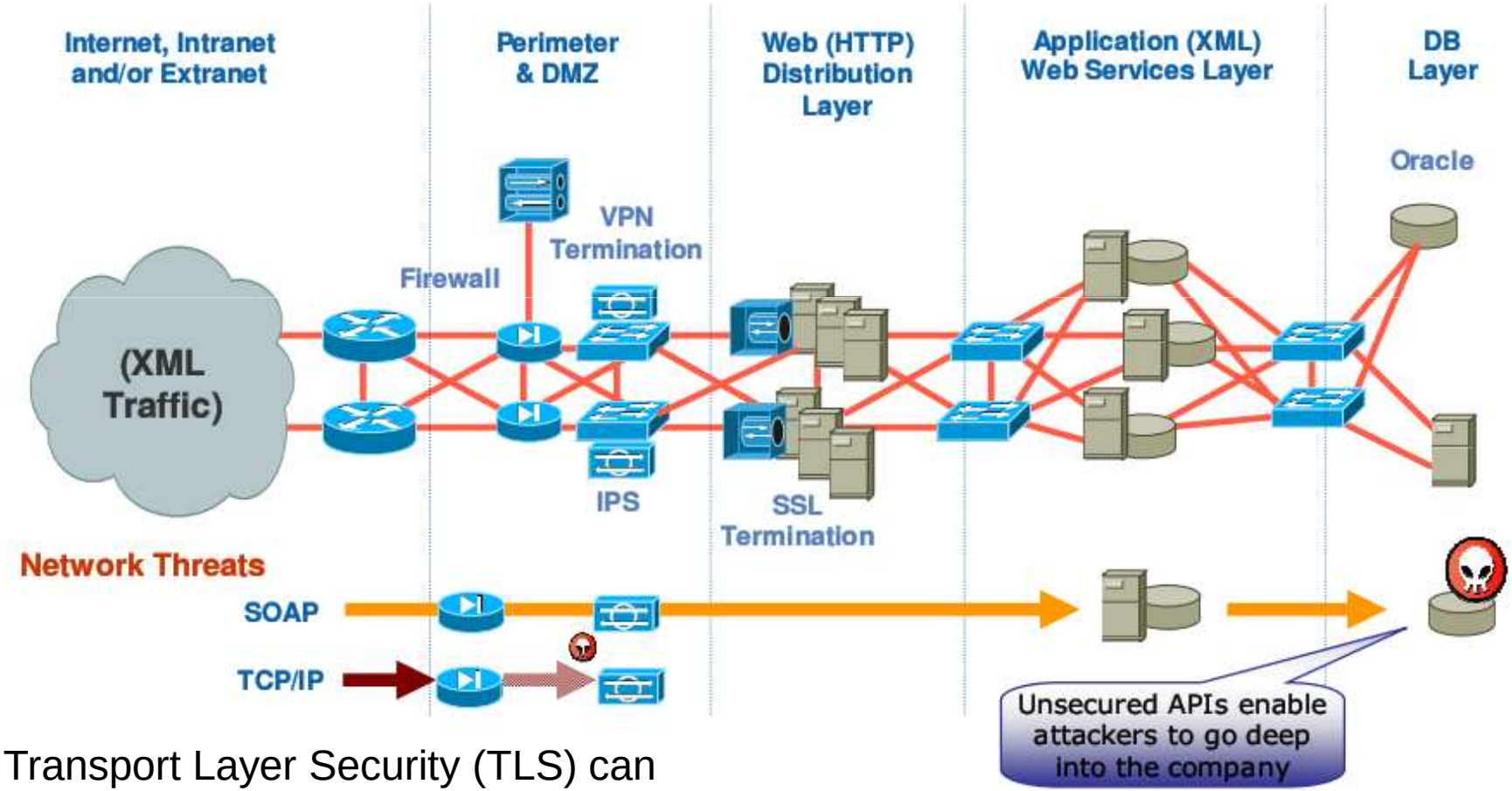
SOA at application layer of OSI



- More layers are being constantly added
  - Security
  - Reliable messaging
  - Manageability

Anatomy of the SOA Security challenge

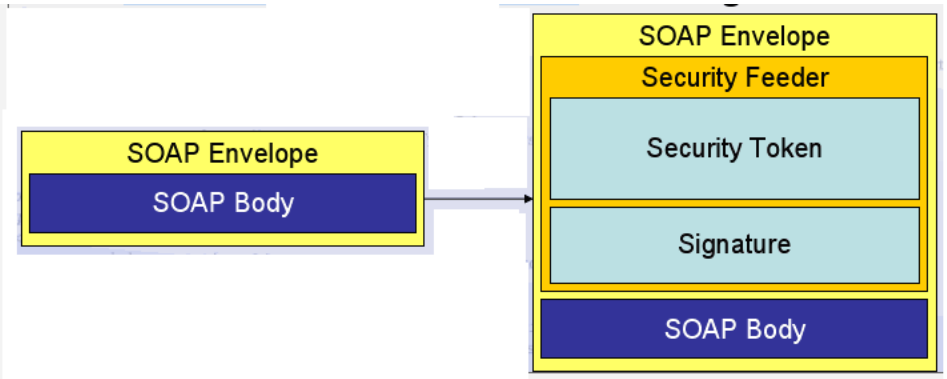
WS-Security is to SOA, SSL is to HTTP



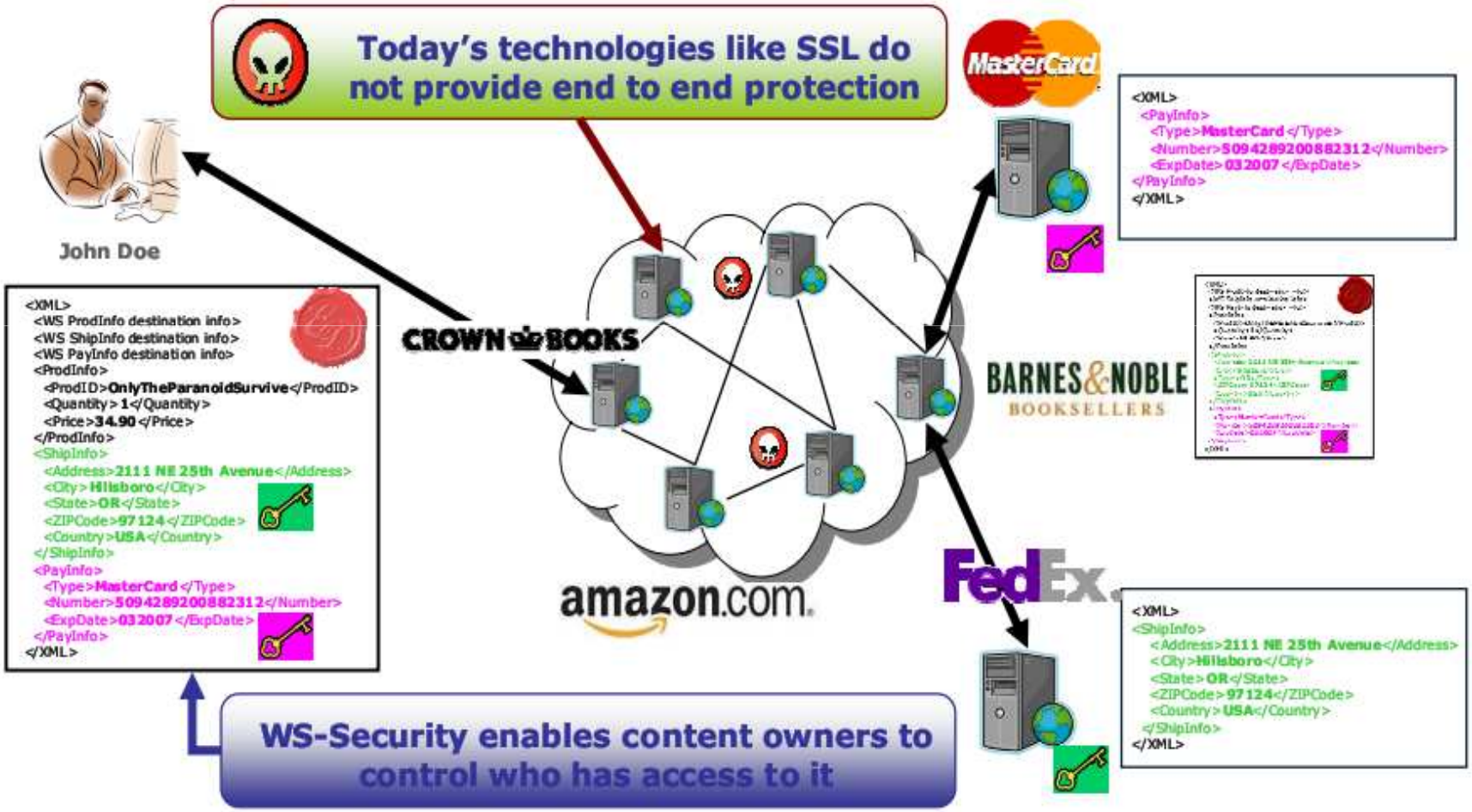
Transport Layer Security (TLS) can provide point-to-point security, but not end-to-end, problem with proxies

WS-Security

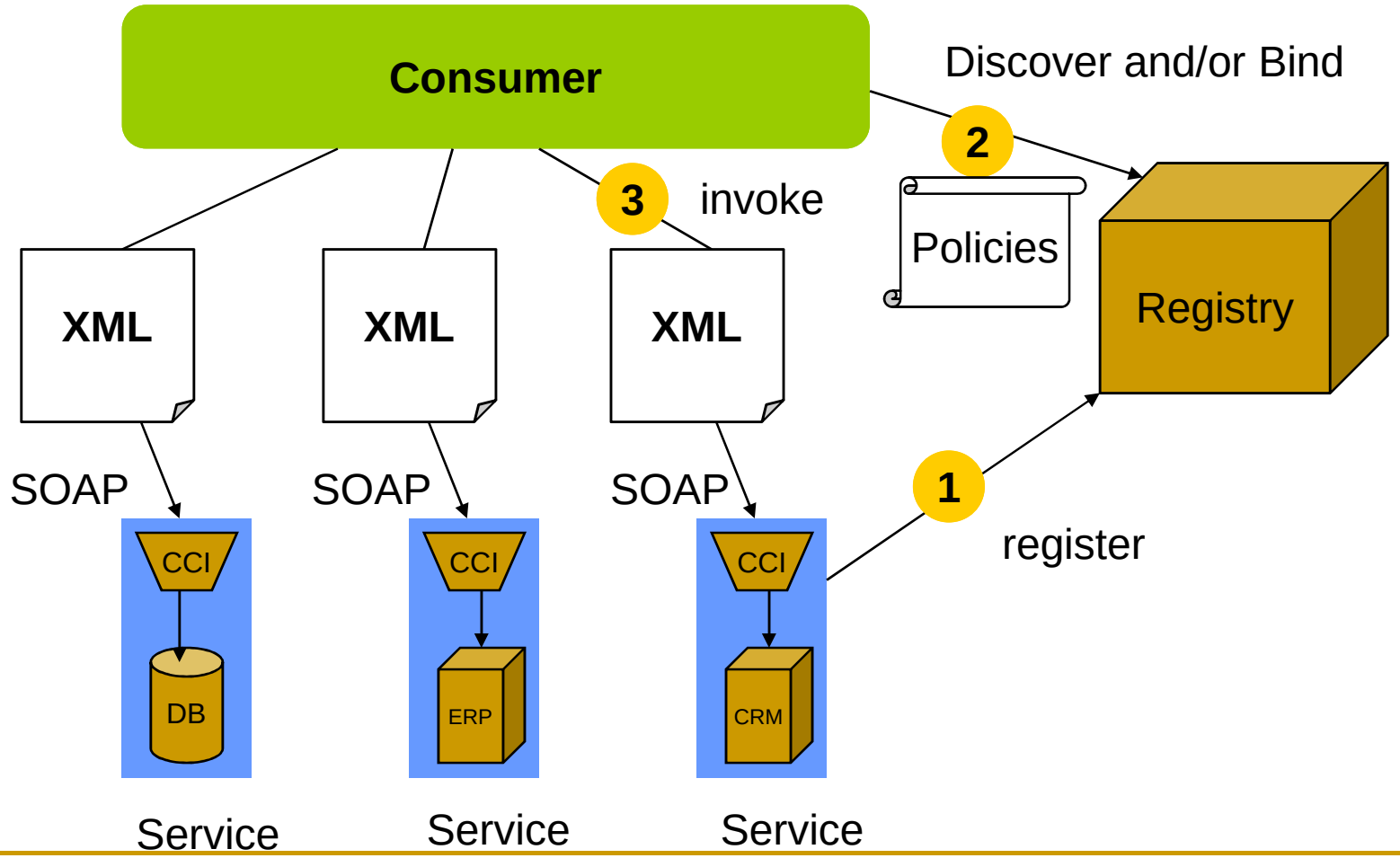
- Enhancement to SOAP
- How to sign SOAP messages to assure integrity.
  - Signed messages provide also non-repudiation.
- How to encrypt SOAP messages to assure confidentiality.
- How to attach security tokens.
- Uses
  - XML Encryption
  - XML Digital Signatures
  - SSL/TLS



Implementasi: **WS-Security**



SOA in practice



NEXT

- .NET Framework vs Java Framework