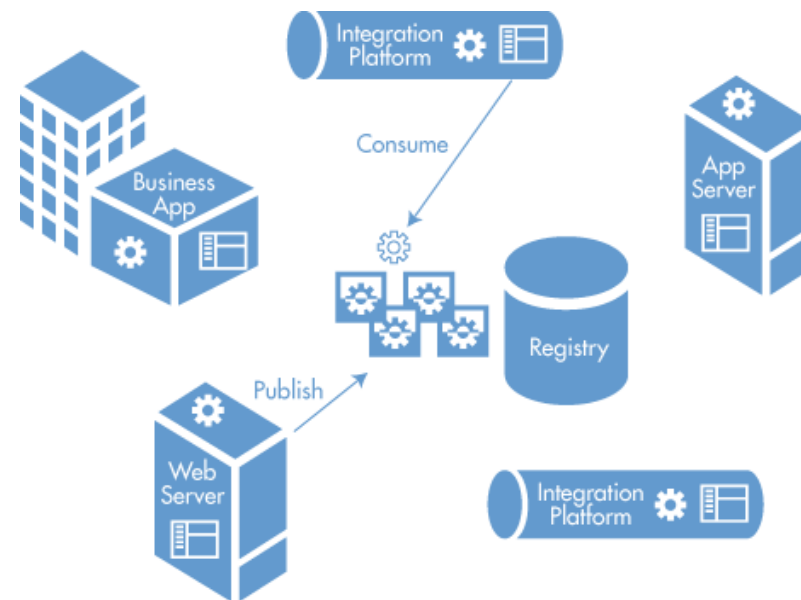


Service-Oriented Architectures

General Principles



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What is a SOA?

Gartner

A style of **multi-tier computing** that helps organizations share logic and data among multiple applications and usage modes.

IBM

An application architecture within which all functions are defined as **independent services** with well-defined invocable **interfaces** which can be called in defined sequences to form **business processes**.

OASIS

A paradigm for organizing and utilizing distributed capabilities that may be under the control of **different ownership domains**. It provides a uniform means to offer, discover, interact with and use capabilities to produce desired effects consistent with measurable preconditions and expectations.

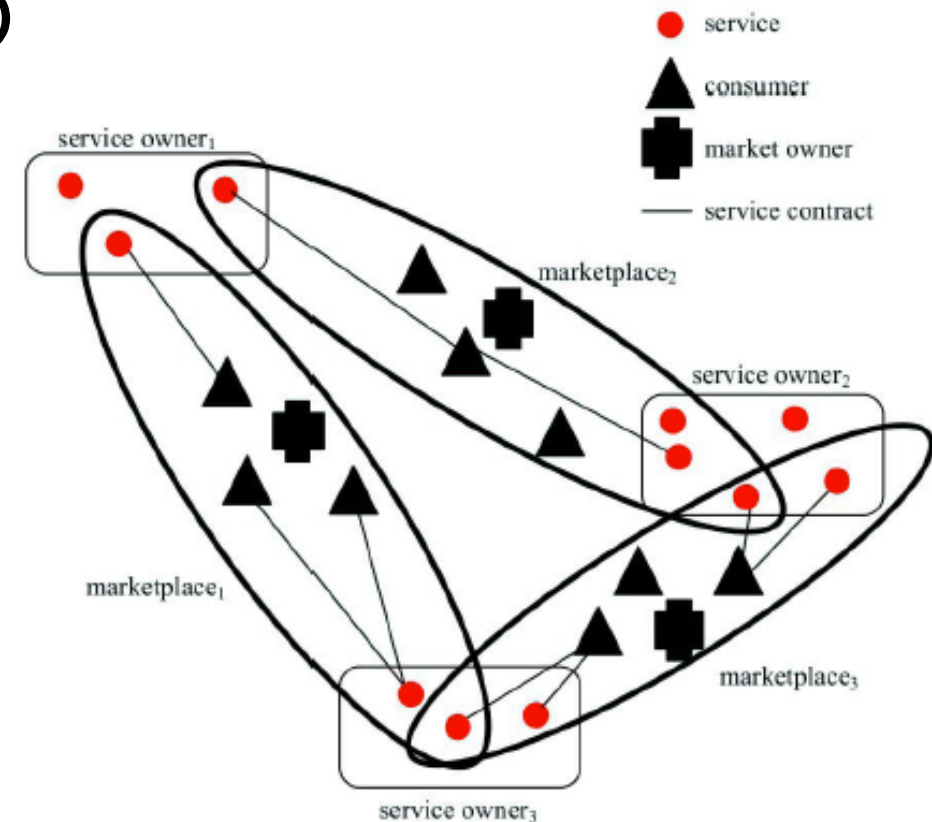
What is a SOA?

Service-Oriented Architecture (SOA)

is the prevalent architectural style in current **middlewarees** for distributed information systems and **Enterprise Application Integration (EAI)**.

The fundamental objective is to allow weakly coupled agents and software components to cooperate.

A service is a work unit (atomic operation) performed by a provider to obtain a result needed by a consumer.



What is a service?

General definition of service:

procedure, method or object with a public and stable interface, which can be invoked by a client.

A service can be considered as the abstract characterization and interface encapsulation of a specific content or resource or computing capability (e.g., the ability of moving files, create processes, provide information, check access rights).

What is a service interface?

A service interface is defined in terms of protocol to be used to interact with the service, format of exchanged data and expected behavior after some messages have been exchanged.

Interface = protocol + format + behavior

- protocol: how to interact with the service
- format: how exchanged data are structured
- behavior: what the service does

Service lifecycle

- 1. Creation:** the service is published, by means of
 - registration into a directory service (in centralized architectures)
 - dissemination of message advertisements (in decentralized architectures)
- 2. Procurement:** provider and consumer establish a service provision contract, by means of
 - discovery: the consumer finds the most suitable service
 - negotiation: the contract is agreed between the two parties
- 3. Enactment:** the service is consumed

Participant roles and interactions

SOA is based upon the interactions between three roles:

- **Provider**: the owner of the service
- **Registry or Broker**: manages repositories of information on providers and their software assets
- **Consumer**: discovers and invokes software assets provided by one or more providers

Quality of Service (QoS)

A same service interface may correspond to different service implementations, with different providers and quality of service (QoS).

QoS is related to non-functional aspects that influence the way a service is consumed, including:

- performance
- availability
- robustness
- required authorizations
- cost

Quality of Service (QoS)

Provider and consumer must establish a **Service Level Agreement (SLA)**, which is a QoS agreement.

Discovery mechanisms are important to allow clients for comparing different service implementations and selecting the most suitable one.

Open source development tools

Apache CXF <http://cxf.apache.org>

An open source services framework which helps you build and develop services using frontend programming APIs, like JAX-WS and JAX-RS. These services can speak a variety of protocols such as SOAP, XML/HTTP, RESTful HTTP, or CORBA and work over a variety of transports. Both WSDL first and Java first approaches are supported.

GlassFish <https://javaee.github.io/glassfish/>

World's first Java EE 7 Application Server. Supports the Java first approach, only.

WildFly <http://wildfly.org>

Previously known as JBoss Application Server. Web services can be developed with JAX-WS or JAX-RS. Several advanced standards are supported: WS-Security, WS-Trust, WS-Reliable Messaging, etc.

Express <http://expressjs.com/>

Very practical for simple RESTful services.

JAX-WS = Java API for Web Services

JAX-RS = Java API for RESTful Services

SoapUI

<https://www.soapui.org/>

SoapUI is the most advanced functional testing tool for service-oriented architectures.

Open source version:

- ✓ SOAP API Testing
- ✓ REST API Testing
- ✓ WSDL Coverage
- ✓ Scripted Assertions
- ✓ Largest Online API Testing Community

The Professional version has many more features.

Postman

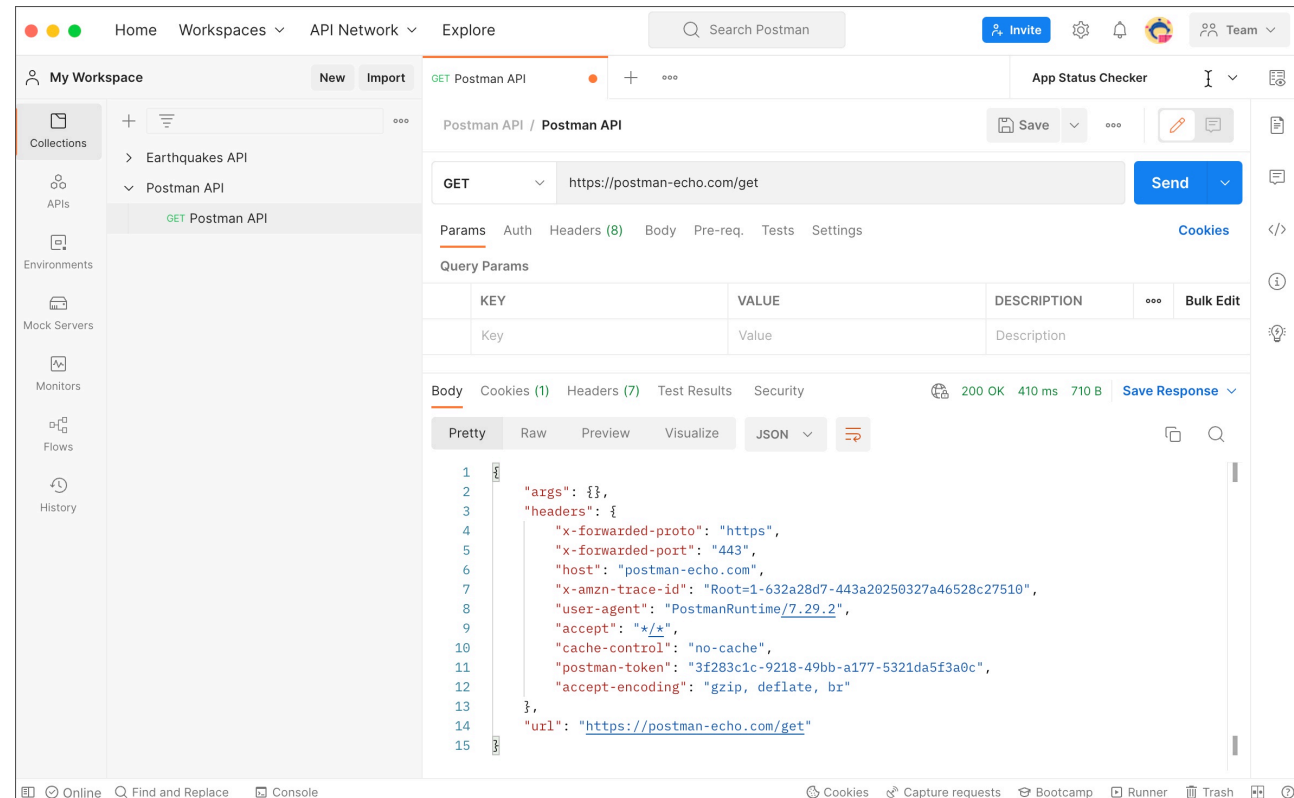
<https://www.postman.com/>

Postman is an API platform for building and using APIs.



The **Postman API client** is the foundational tool of Postman.

It enables to easily explore, debug, and test APIs while also enabling to define complex API requests for HTTP, REST, SOAP, GraphQL, and WebSockets.



Curl

<https://curl.se/>



command line tool and library for transferring data with URLs
(since 1998)

Supports...

DICT, FILE, FTP, FTPS, GOPHER, GOPHERS, **HTTP**, **HTTPS**, IMAP, IMAPS, LDAP, LDAPS, MQTT, POP3, POP3S, RTMP, RTMPS, RTSP, SCP, SFTP, SMB, SMBS, SMTP, SMTPS, TELNET and TFTP.