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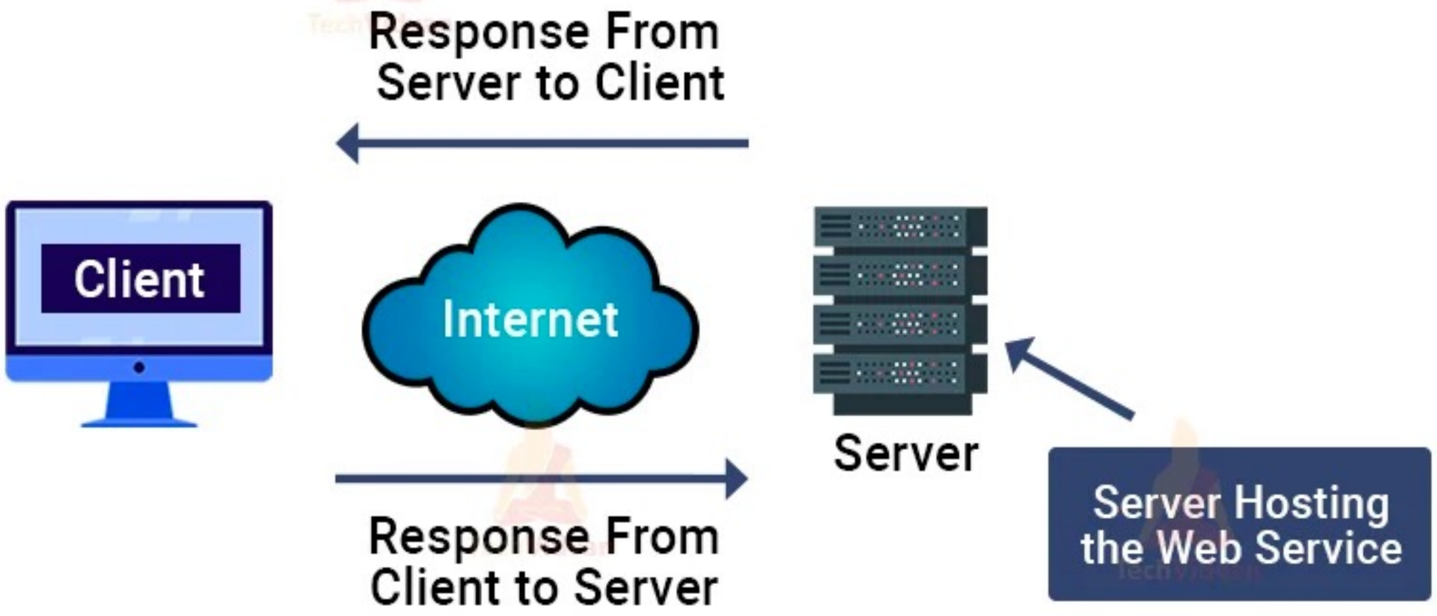
PENS
Pathway in Enterprise Systems Engineering

Pathway in Enterprise Systems Engineering (PENS)

Web services

UAH Jul 2022

How do Web Servers Work?


Response From Server to Client
Client
Internet
Server
Server Hosting the Web Service
Response From Client to Server

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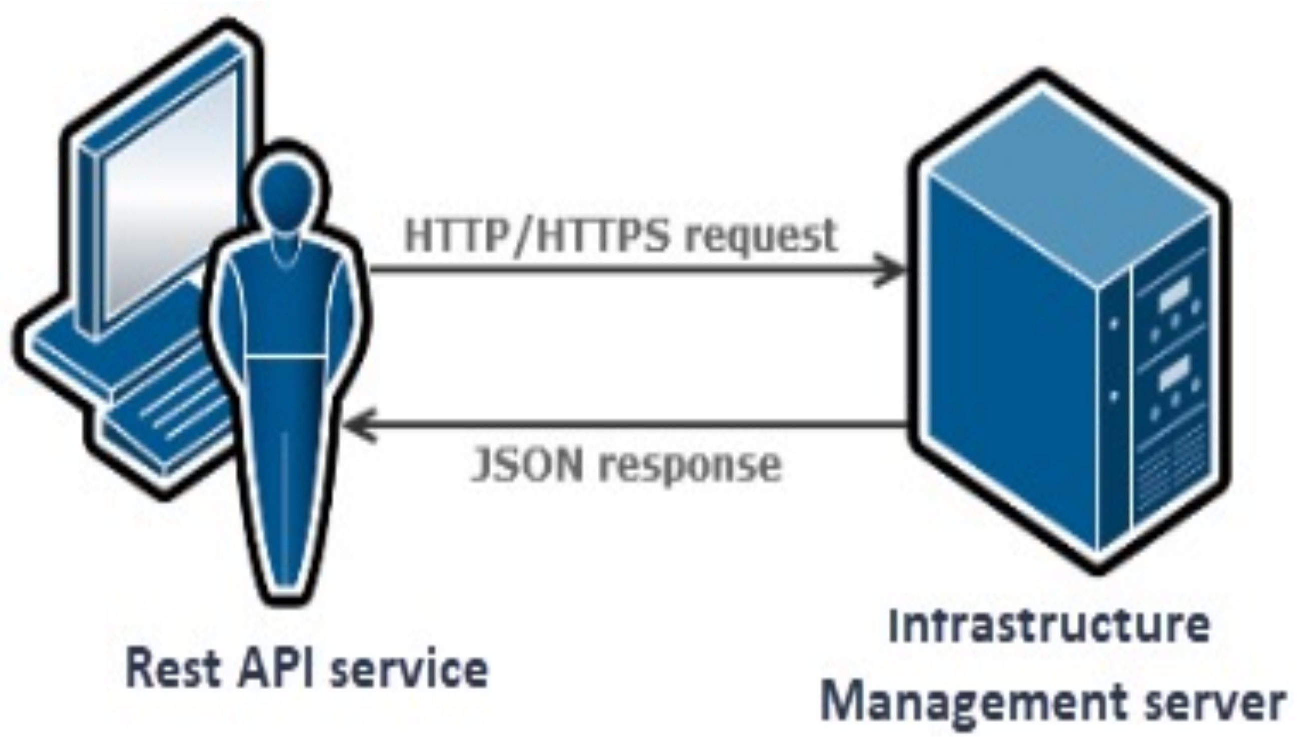
Definition

Web services are open standard (XML, SOAP, HTTP, etc.)

Interact with other web applications for the purpose of exchanging data



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Few Questions

Is it software ? Or something else ?

What is the programming language used to write web services ?

What are the main types of web services ?

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Characteristics

- Self-contained
- Modular
- Distributed
- Dynamic applications
- Published, located, or invoked over the network

Types

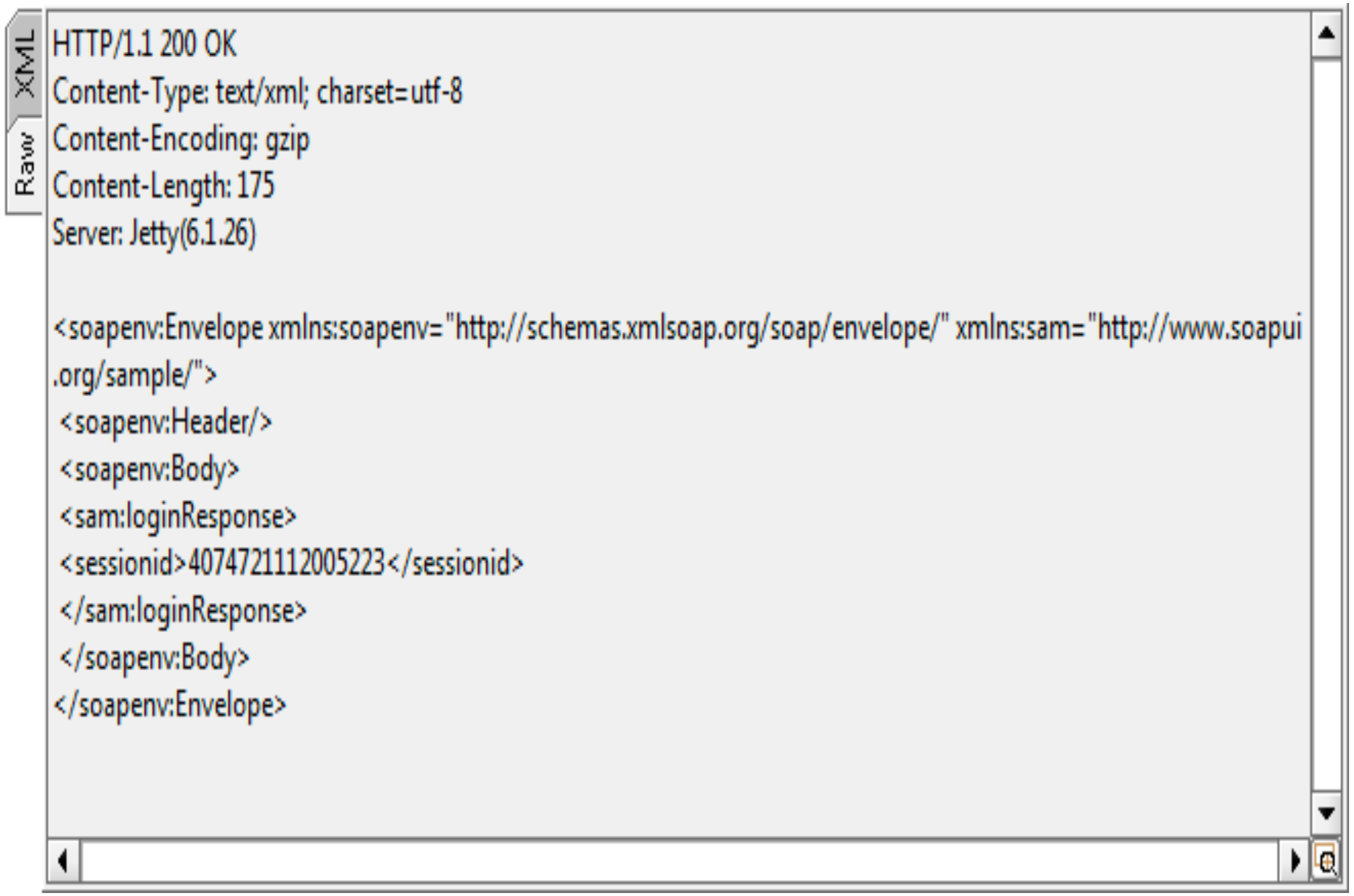
SOAP : XML Based

Restful API : JSON

…

Data Exchange

SOAP

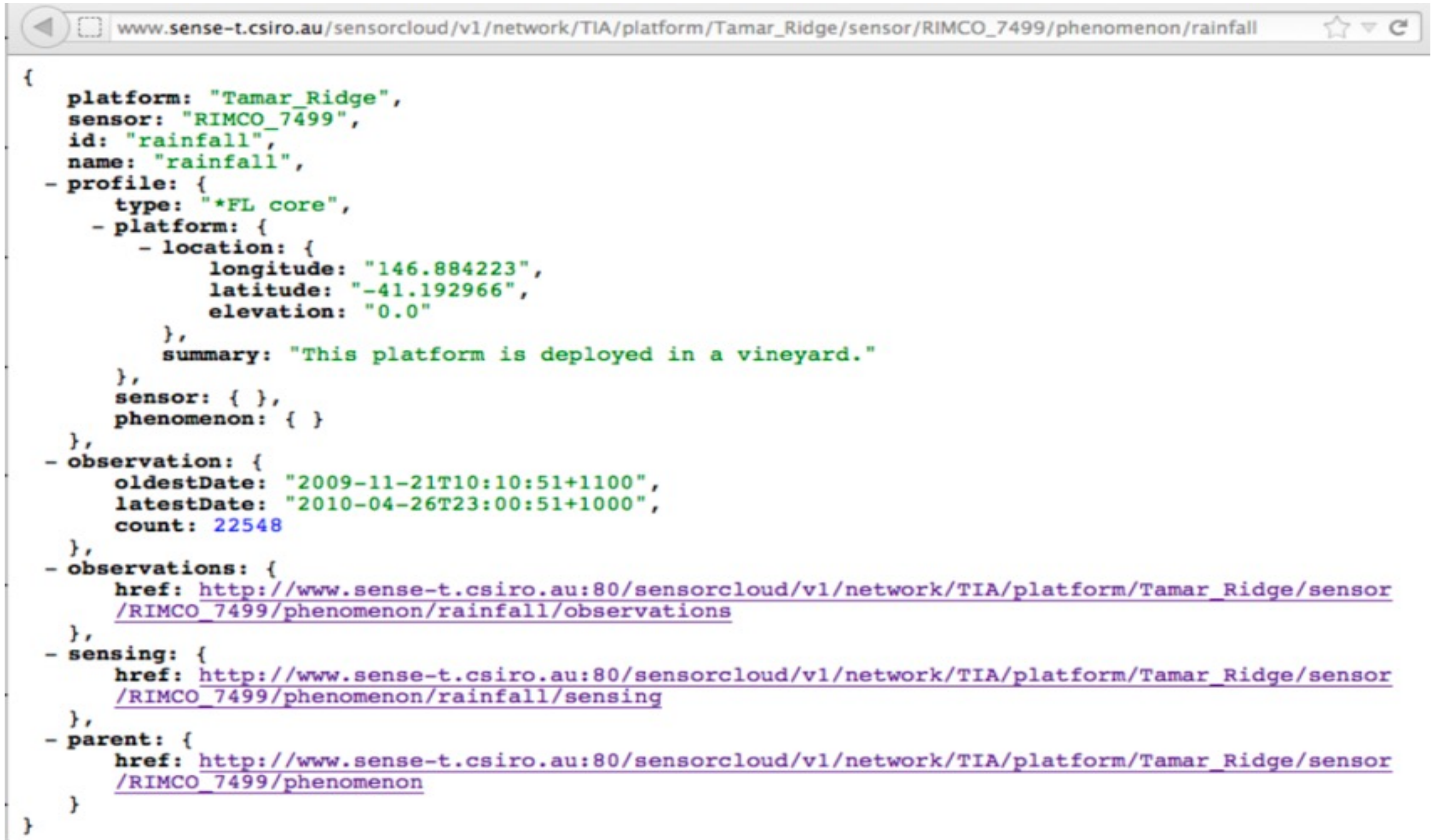


```
HTTP/1.1 200 OK
Content-Type: text/xml; charset=utf-8
Content-Encoding: gzip
Content-Length: 175
Server: Jetty(6.1.26)

<soapenv:Envelope xmlns:soapenv="http://schemas.xmlsoap.org/soap/envelope/" xmlns:sam="http://www.soapui
.org/sample/">
 <soapenv:Header/>
 <soapenv:Body>
 <sam:loginResponse>
 <sessionid>4074721112005223</sessionid>
 </sam:loginResponse>
 </soapenv:Body>
</soapenv:Envelope>
```

Data Exchange

Restful



www.sense-t.csiro.au/sensorcloud/v1/network/TIA/platform/Tamar_Ridge/sensor/RIMCO_7499/phenomenon/rainfall

```
{
    platform: "Tamar_Ridge",
    sensor: "RIMCO_7499",
    id: "rainfall",
    name: "rainfall",
  - profile: {
        type: "*FL core",
      - platform: {
          - location: {
                longitude: "146.884223",
                latitude: "-41.192966",
                elevation: "0.0"
            },
            summary: "This platform is deployed in a vineyard."
        },
        sensor: { },
        phenomenon: { }
    },
  - observation: {
        oldestDate: "2009-11-21T10:10:51+1100",
        latestDate: "2010-04-26T23:00:51+1000",
        count: 22548
    },
  - observations: {
        href: http://www.sense-t.csiro.au:80/sensorcloud/v1/network/TIA/platform/Tamar_Ridge/sensor
        /RIMCO_7499/phenomenon/rainfall/observations
    },
  - sensing: {
        href: http://www.sense-t.csiro.au:80/sensorcloud/v1/network/TIA/platform/Tamar_Ridge/sensor
        /RIMCO_7499/phenomenon/rainfall/sensing
    },
  - parent: {
        href: http://www.sense-t.csiro.au:80/sensorcloud/v1/network/TIA/platform/Tamar_Ridge/sensor
        /RIMCO_7499/phenomenon
    }
}
```

Which one is better ?

- Always in computer , no black and white
- Most people now use Restful ? Why ?

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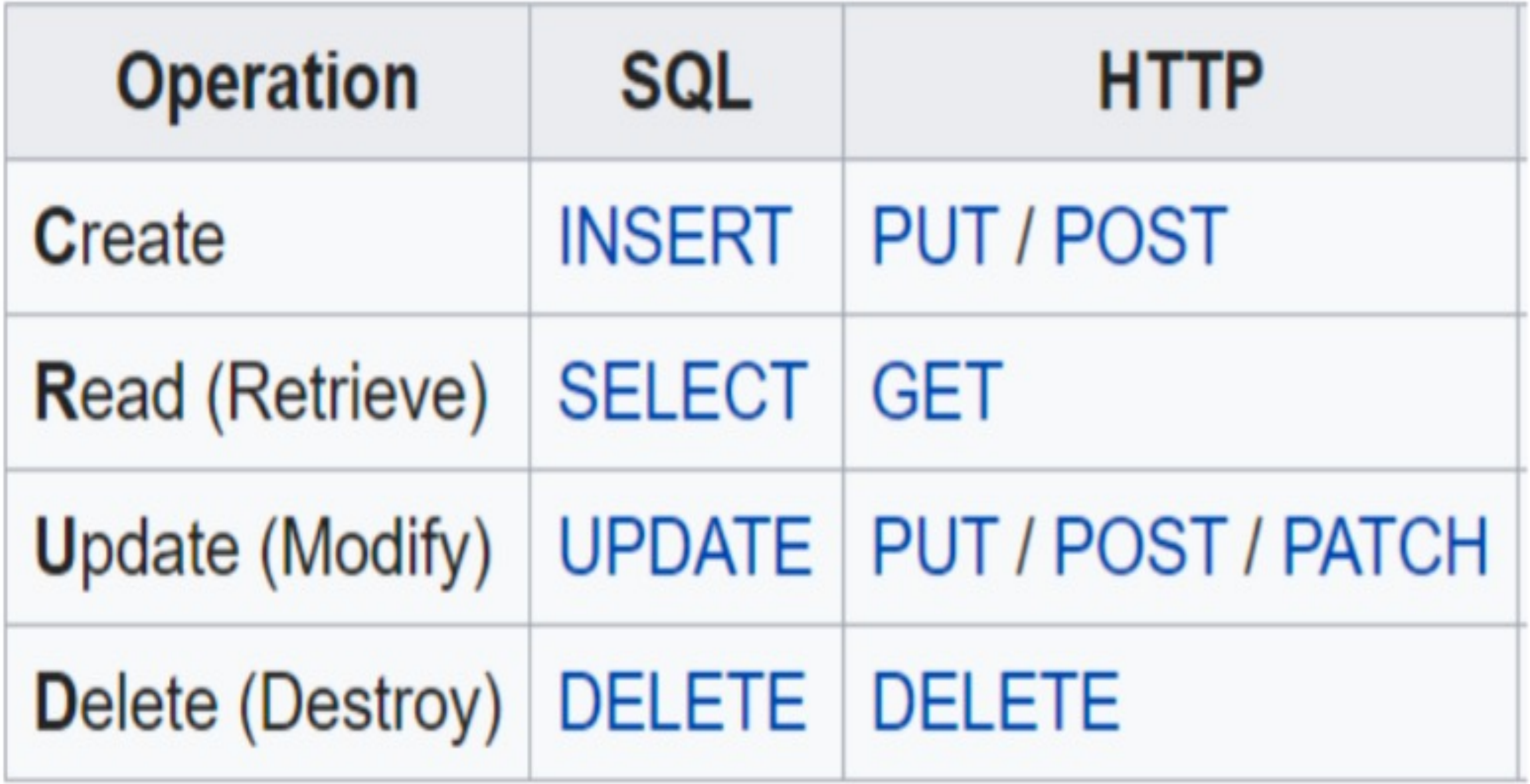
Why Database protocol is Similar to Web services protocol



Operation	SQL	HTTP
Create	INSERT	PUT / POST
Read (Retrieve)	SELECT	GET
Update (Modify)	UPDATE	PUT / POST / PATCH
Delete (Destroy)	DELETE	DELETE

Conclusion

Most IT people use now Rest and not SOAP

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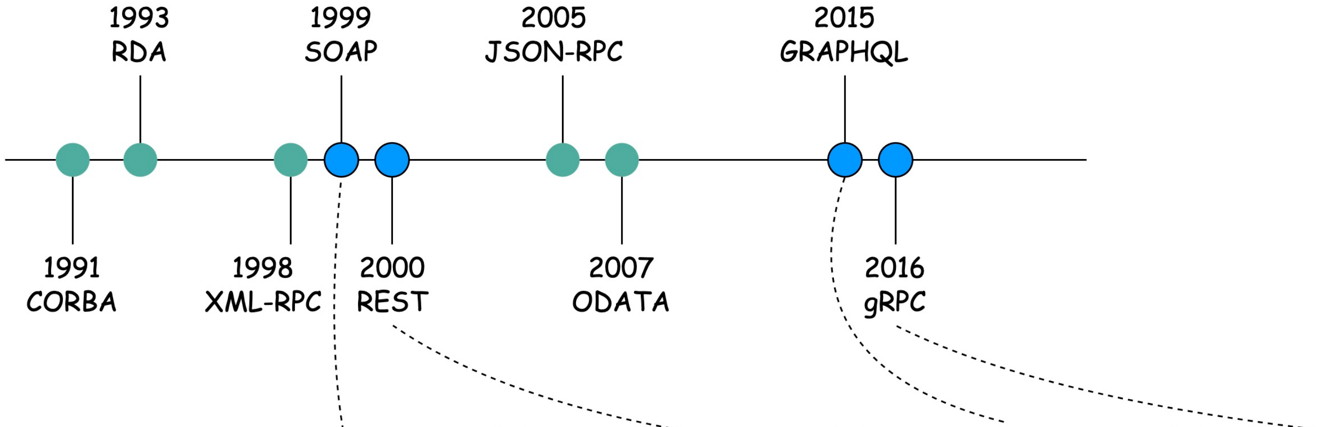
API Architectural Styles Comparison

Source: altexsoft



	SOAP (Simple Object Access Protocol)	REST (REpresentational State Transfer)	GraphQL	RPC (Remote Procedure Call)
Organized in terms of	enveloped message structure	compliance with six architectural constraints	schema & type system	local procedure call
Format	XML only	XML, JSON, HTML, plain text	JSON	JSON, XML, Protobuf, Thrift, FlatBuffers
Learning curve	Difficult	Easy	Medium	Easy
Community	Small	Large	Growing	Large
Use cases	- payment gateways - identity management - CRM solutions - financial and telecommunication services - legacy system support	- public APIs - simple resource-driven apps	- mobile APIs - complex systems - micro-services	- command and action-oriented APIs - high performance communication in massive micro-services systems

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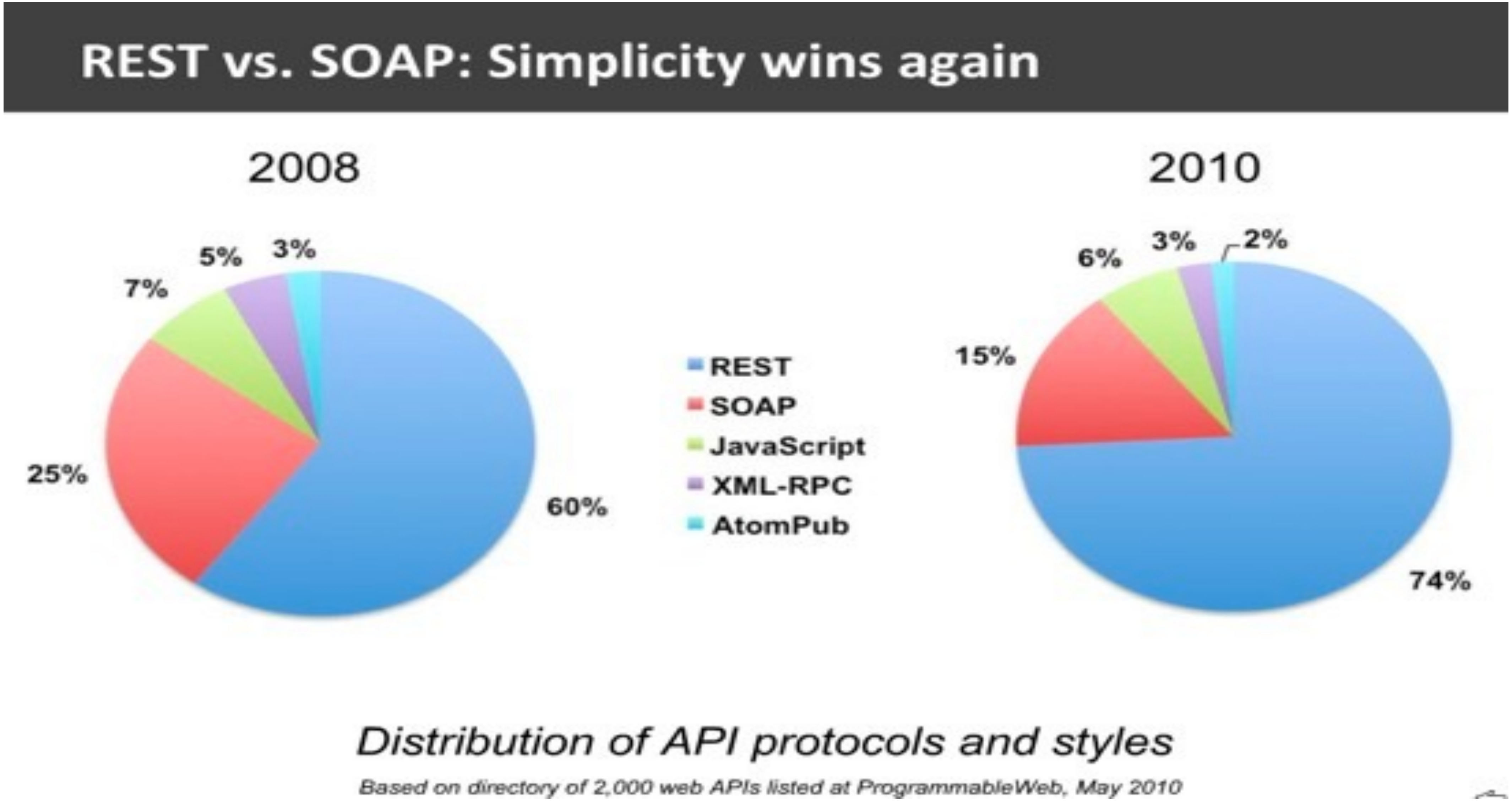
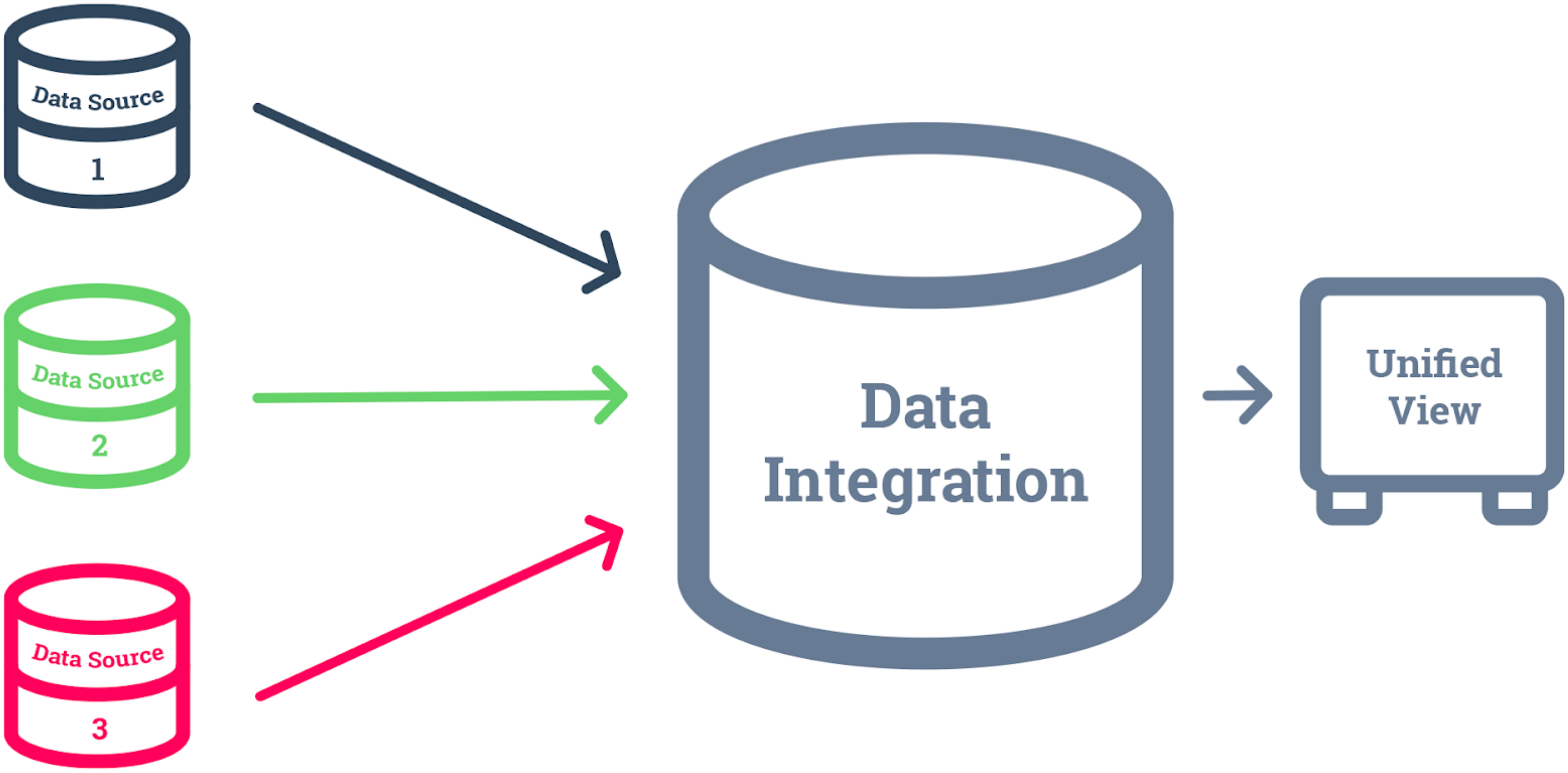


REST vs. SOAP: Simplicity wins again

Distribution of API protocols and styles

Based on directory of 2,000 web APIs listed at ProgrammableWeb, May 2010

You remember ?



Instead of Accessing centralized database directly

Centralized Server expose Web services to be called by the data sources/applications

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Popular frameworks

spring
by Pivotal
ANGULARJS
by Google
React
{ REST }
spring
Data REST
Dropwizard
BACKBONE.JS
Jersey
JAX-RS
spring
HATEOAS

Quarkus: a next-generation Kubernetes native Java framework

Practical Example to follow

But before that we need to use Maven

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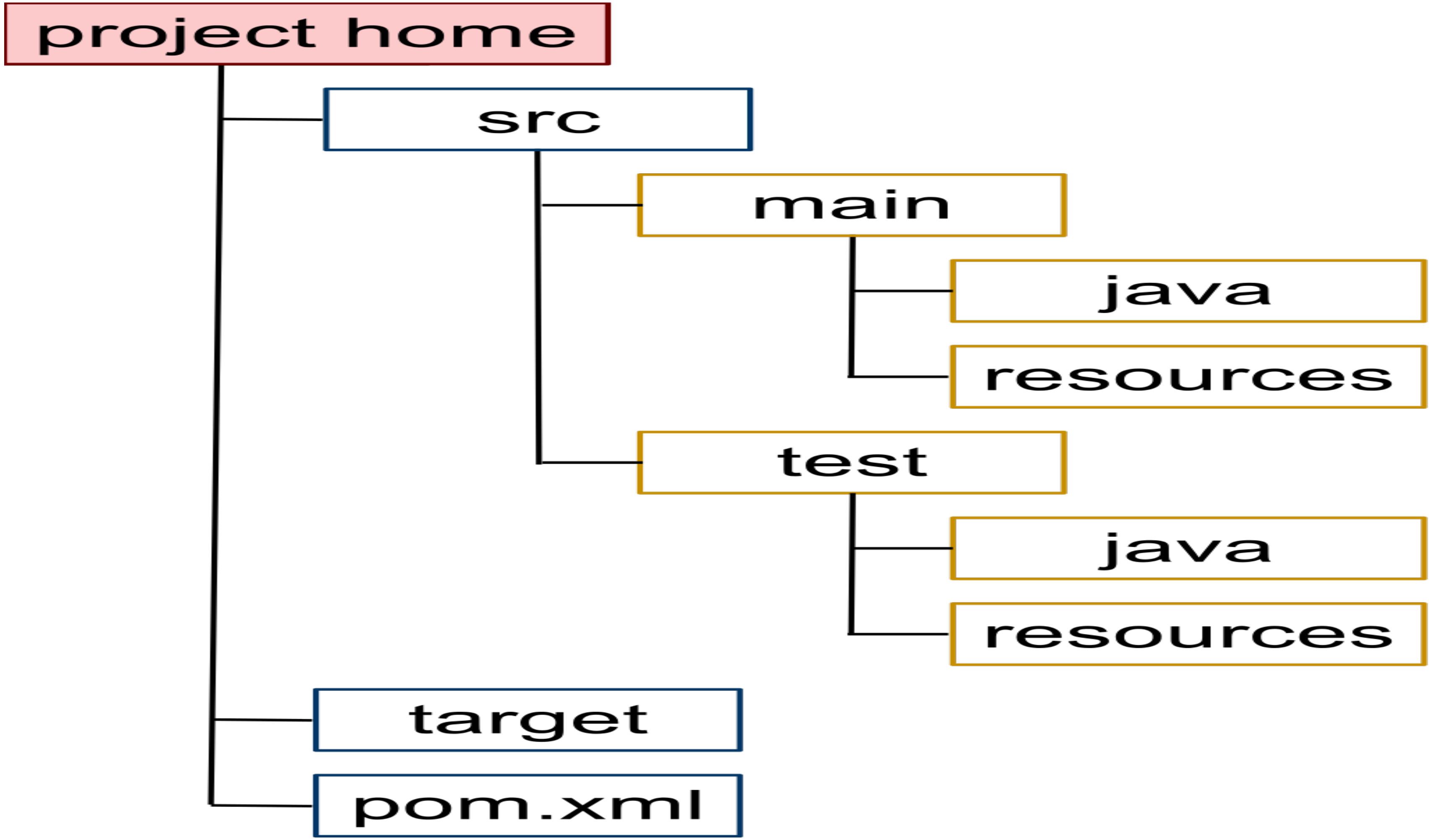
What’s Maven ?

- Specific to Java , but
- It can also be used to build and manage projects written in C#, Ruby, Scala, and other languages.

- Build Automation tool ? How



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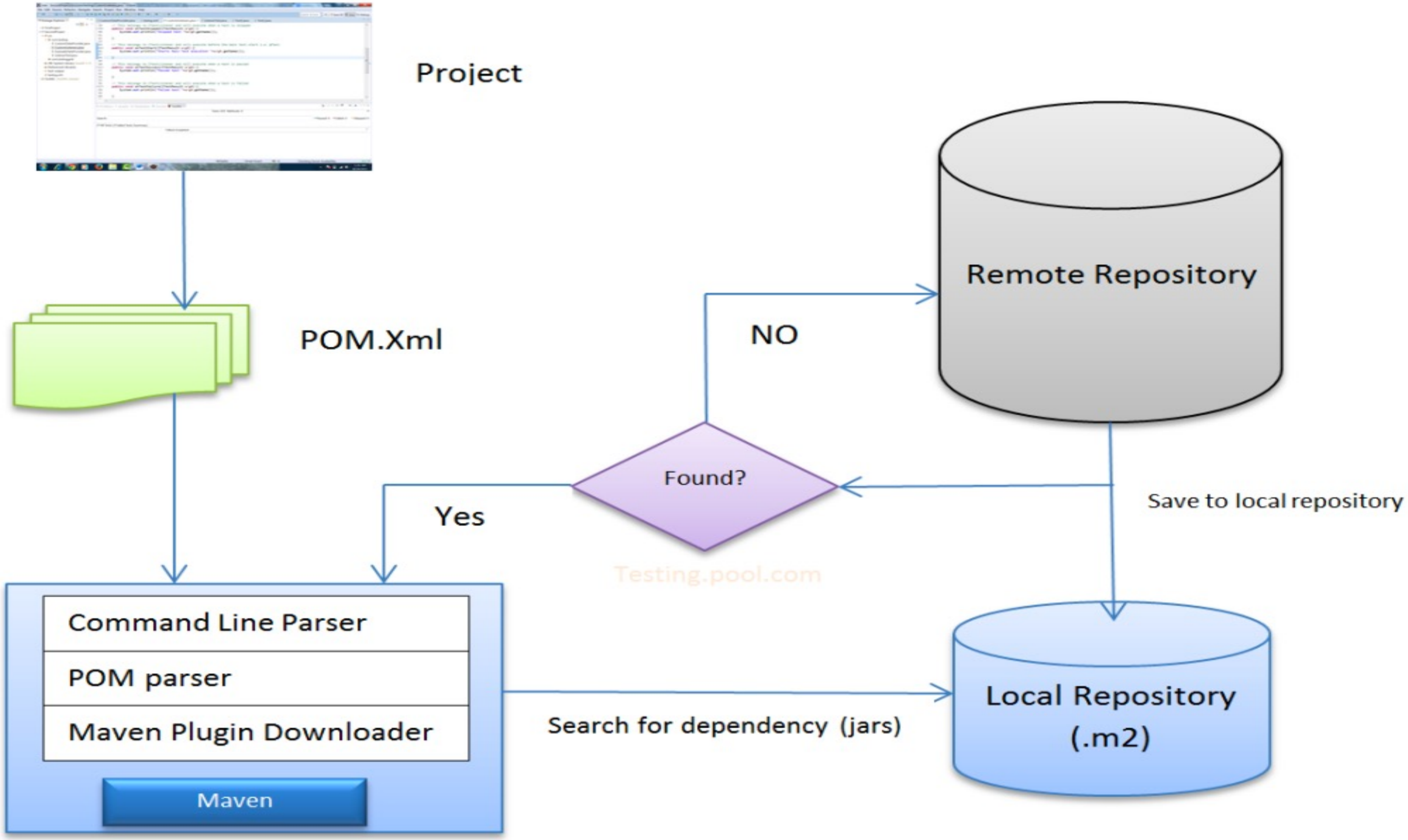
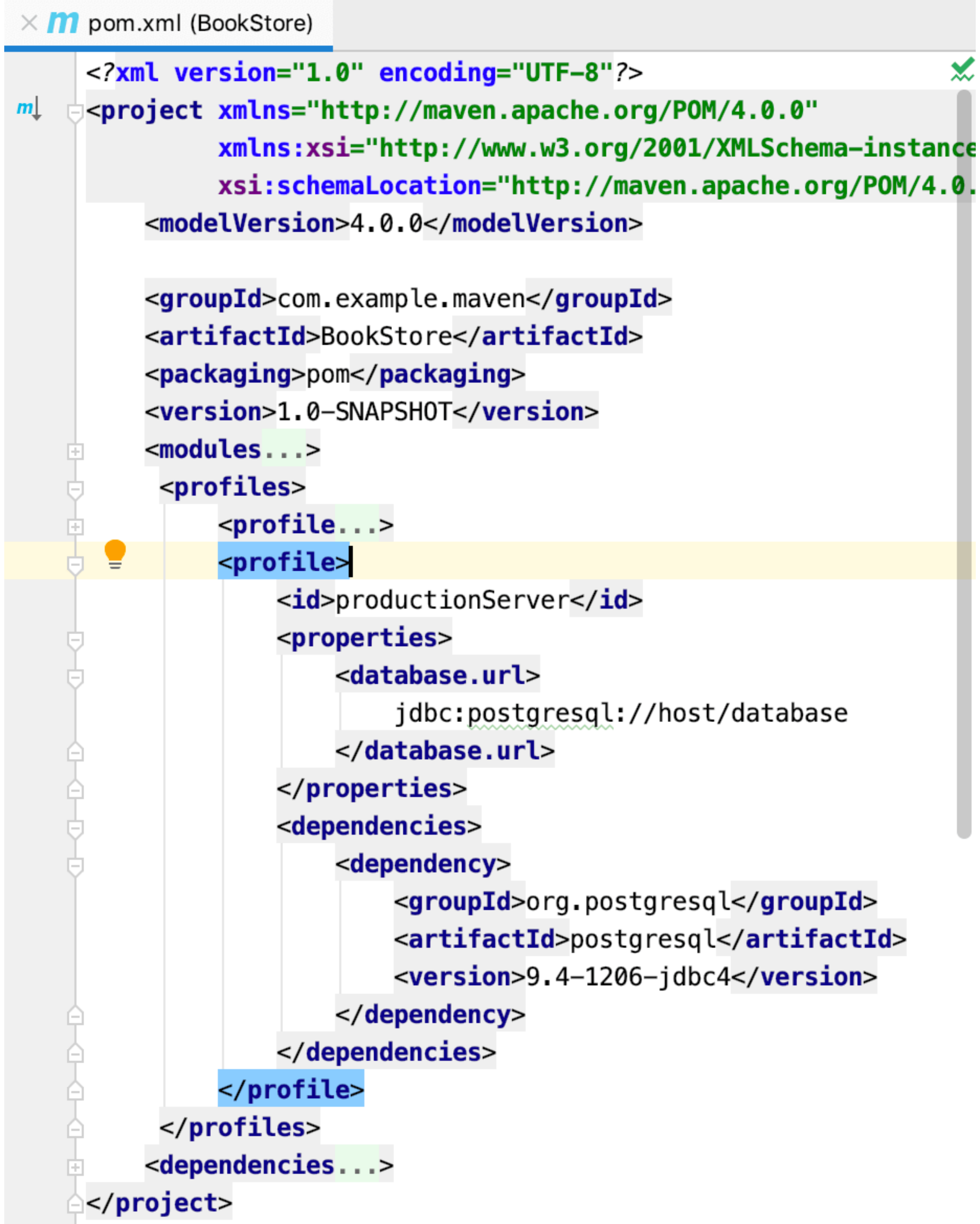

Project
POM.Xml
Remote Repository
NO
Found?
Yes
Save to local repository
Command Line Parser
POM parser
Maven Plugin Downloader
Maven
Search for dependency (jars)
Local Repository
(.m2)



```xml
<?xml version="1.0" encoding="UTF-8"?>
<project xmlns="http://maven.apache.org/POM/4.0.0"
         xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance
         xsi:schemaLocation="http://maven.apache.org/POM/4.0.
    <modelVersion>4.0.0</modelVersion>

    <groupId>com.example.maven</groupId>
    <artifactId>BookStore</artifactId>
    <packaging>pom</packaging>
    <version>1.0-SNAPSHOT</version>
    <modules...>
     <profiles>
         <profile...>
         <profile>
             <id>productionServer</id>
             <properties>
                 <database.url>
                     jdbc:postgresql://host/database
                 </database.url>
             </properties>
             <dependencies>
                 <dependency>
                     <groupId>org.postgresql</groupId>
                     <artifactId>postgresql</artifactId>
                     <version>9.4-1206-jdbc4</version>
                 </dependency>
             </dependencies>
         </profile>
     </profiles>
    <dependencies...>
</project>
```

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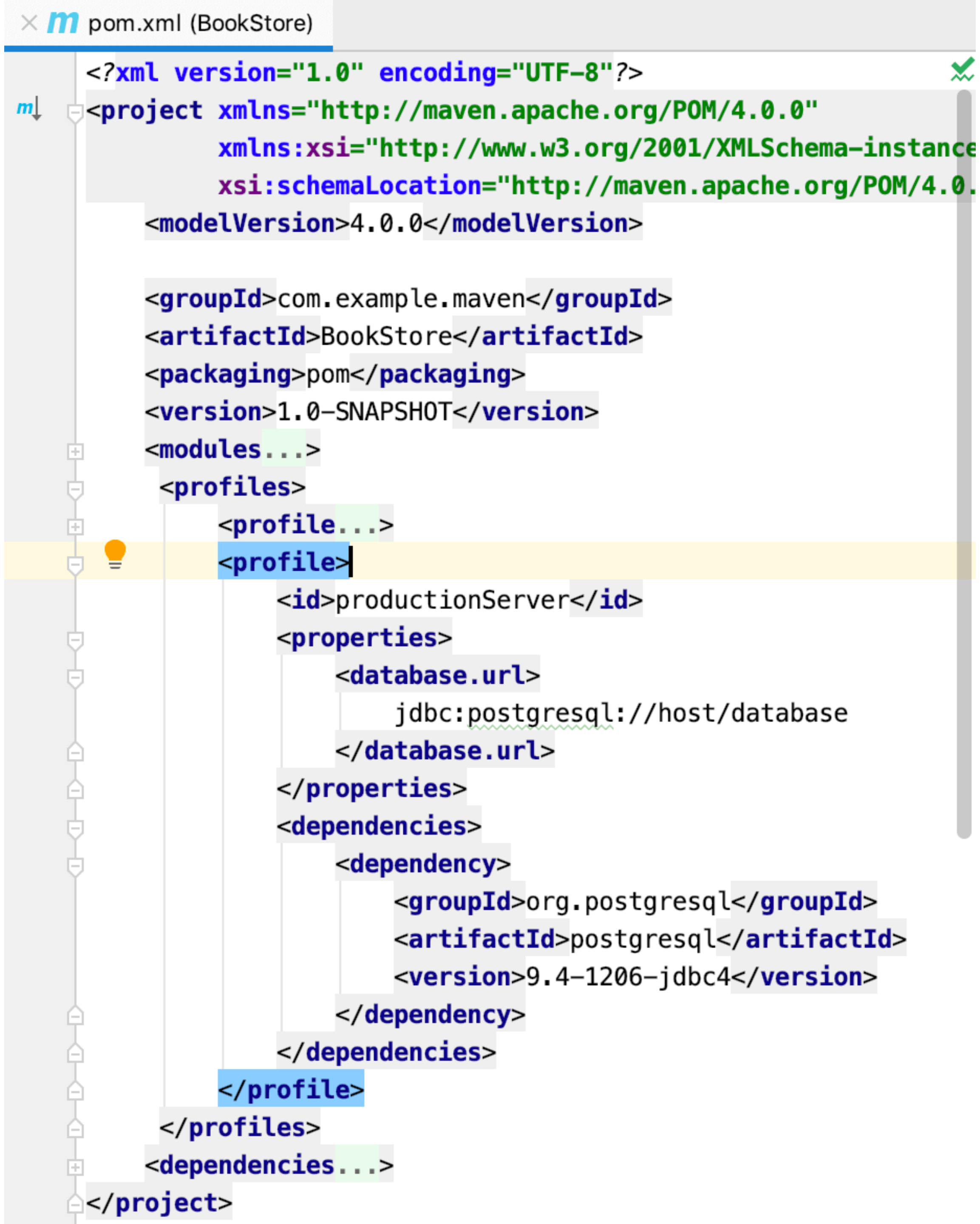

```xml
<?xml version="1.0" encoding="UTF-8"?>
<project xmlns="http://maven.apache.org/POM/4.0.0"
         xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance
         xsi:schemaLocation="http://maven.apache.org/POM/4.0.
    <modelVersion>4.0.0</modelVersion>

    <groupId>com.example.maven</groupId>
    <artifactId>BookStore</artifactId>
    <packaging>pom</packaging>
    <version>1.0-SNAPSHOT</version>
    <modules...>
     <profiles>
         <profile...>
         <profile>
             <id>productionServer</id>
             <properties>
                 <database.url>
                     jdbc:postgresql://host/database
                 </database.url>
             </properties>
             <dependencies>
                 <dependency>
                     <groupId>org.postgresql</groupId>
                     <artifactId>postgresql</artifactId>
                     <version>9.4-1206-jdbc4</version>
                 </dependency>
             </dependencies>
         </profile>
     </profiles>
    <dependencies...>
</project>
```

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ORM (Object Relational Mapping)

- Why we need ORM ?

- We work with databases as backend in every aspect for Data persistence

- So, there is a need to insert , update, retrieve data even when we use ??????

ORM (Object Relational Mapping)/Cont.

- Use JPA to map objects to database Tables
- Use other features like connection pooling etc

Examples

- Hibernate
- MyBatis
- …

QUARKUS + Hibernate

Practical Exercise 2 : Data Integrations Using web Services

- Complete copy Example to Cloud Database Using Transactions

- Build a small Quarkus API

- Extra : Use JPA with Quarkus (Panache)

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