Introduction to API Testing

Lesson 1:Introduction to API Testing

Capgemini

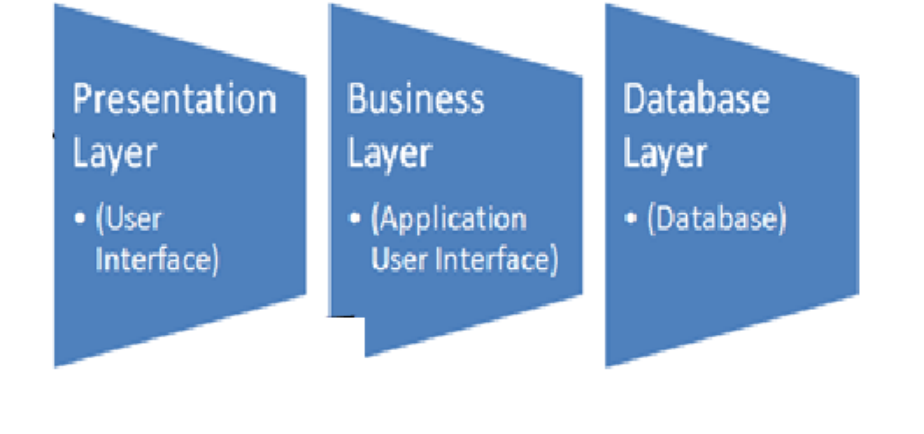
Lesson Objectives

To understand the following topics:

- What is API
- Types of API’s
- What are Web Services
- Types Of Web Services and Web Services Components
- Difference between Web Services and API
- API Testing Important Terms
- What is API Testing
- Why do we need to perform API testing?
- The Benefits of API Testing
- API testing types
- API testing best practices
- Types of Bugs that API testing detects
- Challenges in API testing
- API testing tools Selection Criteria
- API Testing Tools
- Summary

What is API

- APIs, or Application Programming Interfaces, are the connecting tissue between different systems or layers of an application.
- Applications often have three layers: a data layer, a service (API) layer, and a presentation (UI) layer.



- An API is a Software Interface not a user interface.
- It is a software interface that allows two applications to interact with each other without any user intervention.
- APIs provides product or service to communicate with other products and services without having to know how they're implemented.
- APIs are implemented by writing function calls in the program.

Types of APIs

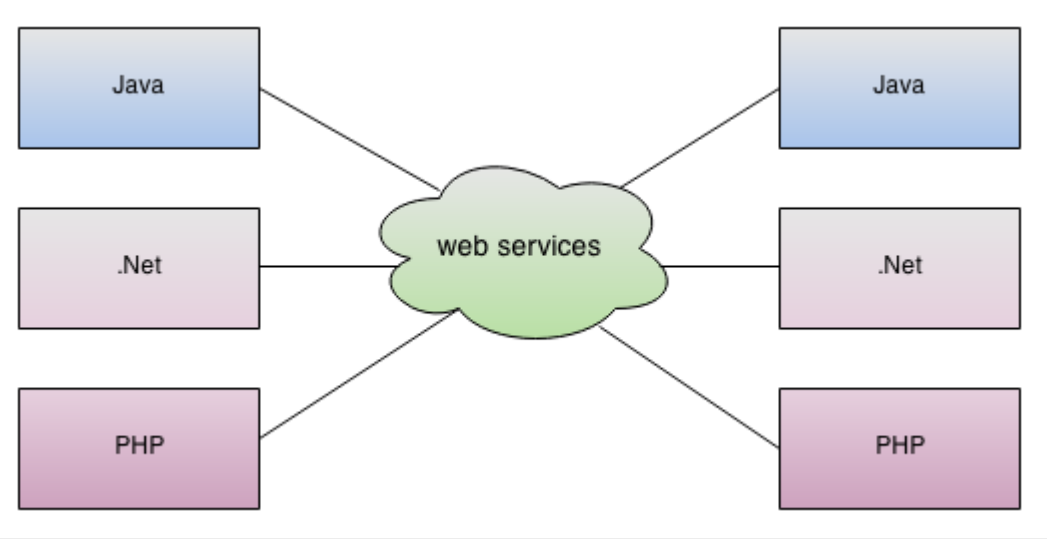
- There are numerous types of APIs few are the examples given below:
  - Java APIs within the class.
  - Web APIs ex SOAP, RPC and REST.

There are 15,000 publicly available APIs, according to Programmable Web.

Multiple Private APIs are used by companies to to expand their internal and external capabilities.

What are Web Services

- Web Services is a client server application or application component for communication.
- It is method of communication between two devices over network.
- It is a software system for interoperable machine to machine communication.
- It is a collection of standards or protocols for exchanging information between two devices or application.



Types Of Web Services and Web Services Components

- There are mainly two types of web services.
  - SOAP web services.
  - RESTful web services.

Web Services components

- There are three major web service components.
  - SOAP
  - WSDL
  - UDDI

Web Services Components - SOAP

- SOAP is an acronym for Simple Object Access Protocol.
- SOAP is a XML-based protocol for accessing web services.
- SOAP is a W3C recommendation for communication between applications.
- SOAP is XML based, so it is platform independent and language independent. In other words, it can be used with Java, .Net or PHP language on any platform.
- Advantages of Soap Web Services
  - WS Security
  - Language and Platform independent
- Disadvantages of Soap Web Services
  - Slow
  - WSDL dependency

Web Services Components - WSDL

- WSDL is an acronym for Web Services Description Language.
- WSDL is a xml document containing information about web services such as method name, method parameter and how to access it.
- WSDL is a part of UDDI. It acts as a interface between web service applications.
- WSDL is pronounced as wiz-dull.

Web Services Components - UDDI

- UDDI is an acronym for Universal Description, Discovery and Integration.
- UDDI is a XML based framework for describing, discovering and integrating web services.
- UDDI is a directory of web service interfaces described by WSDL, containing information about web services.

What is RESTful Web Services

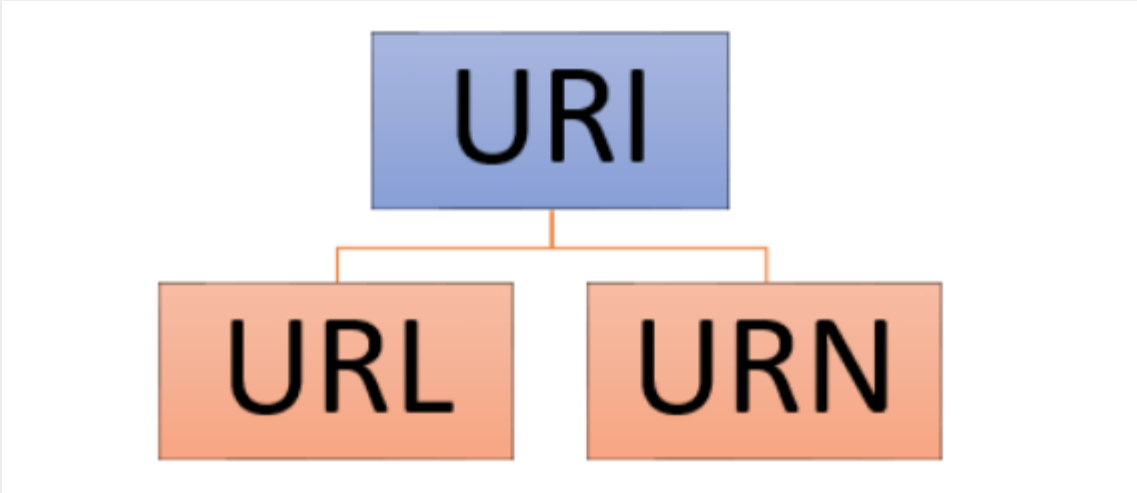
- REST stands for Representational State Transfer.
- REST is an architectural style not a protocol.
- Advantages of RESTful Web Services
  - **Fast**: RESTful Web Services are fast because there is no strict specification like SOAP. It consumes less bandwidth and resource.
  - **Language and Platform independent:** RESTful web services can be written in any programming language and executed in any platform.
  - **Can use SOAP:** RESTful web services can use SOAP web services as the implementation.
  - **Permits different data format:** RESTful web service permits different data format such as Plain Text, HTML, XML and JSON.

What is difference between API and Web Services

Web Service	API
All web services are APIs.	All APIs are not web services.
It supports XML.	Responses are formatted using Web API's MediaTypeFormatter into XML, JSON, or any other given format.
You need a SOAP protocol to send or receive and data over the network. Therefore it does not have light-weight architecture.	API has a light-weight architecture.
It can be used by any client who understands XML.	It can be used by a client who understands JSON or XML.
Web service uses three styles: REST, SOAP, and XML-RPC for communication.	API can be used for any style of communication.
It provides supports only for the HTTP protocol.	It provides support for the HTTP/s protocol: URL Request/Response Headers, etc.

What is URI

- URI- Uniform Resource Identifier is a string containing characters that identify a physical or logical resource



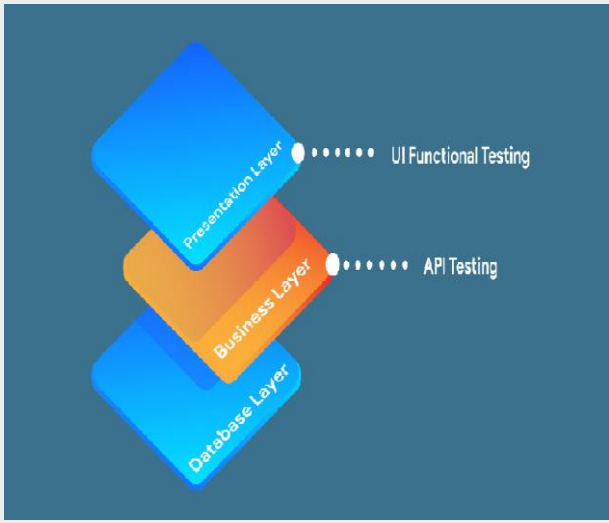
- **URL:** URL specifies a location on the computer network and technique for retrieving it.
- **URN:** Uniform Resource Name (URN) is an internet resource that specifies URN scheme.

Status Code

- HTTP defines these standard status codes that can be used to convey the results of a client's request. The status codes are divided into the five categories.
  - 1xx: Informational – Communicates transfer protocol-level information.
  - 2xx: Success – Indicates that the client's request was accepted successfully.
  - 3xx: Redirection – Indicates that the client must take some additional action in order to complete their request.
  - 4xx: Client Error – This category of error status codes points the finger at clients.
  - 5xx: Server Error – The server takes responsibility for these error status codes.

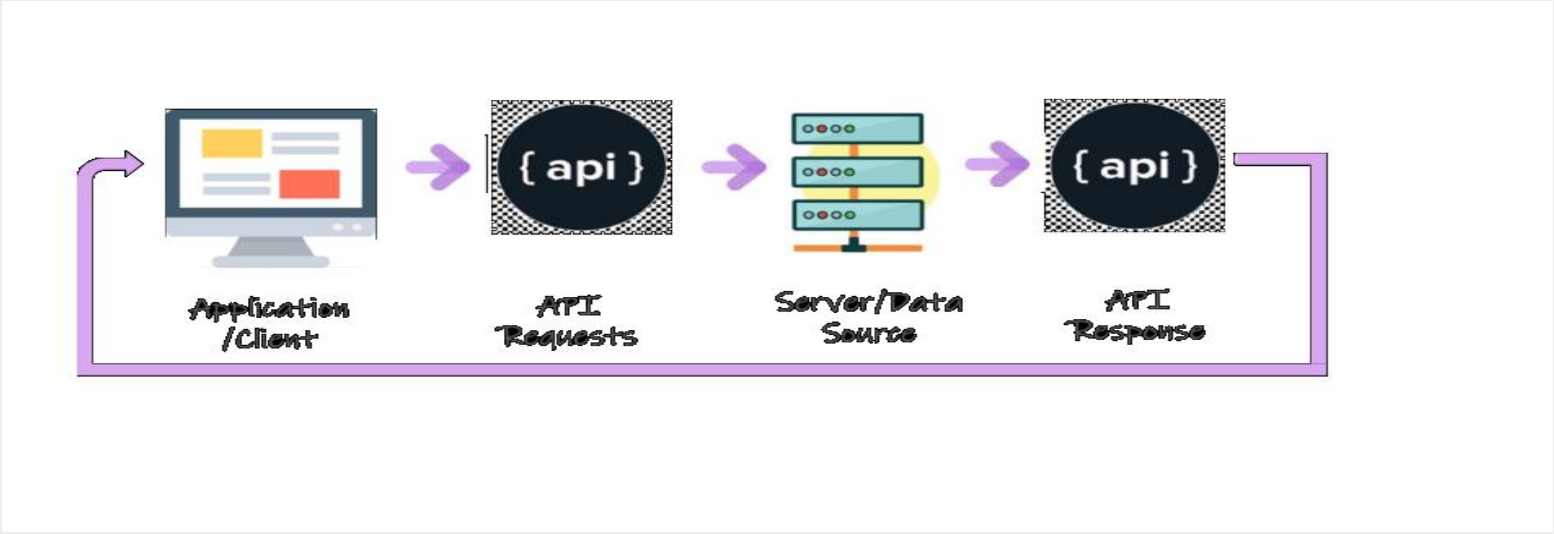
What is API Testing

- API Testing API TESTING is a software testing type that validates APIs.
- It checks the functionality, reliability, performance, and security of the programming interfaces.
- API Testing is performed at the most critical layer, the business Layer where business logic processing is carried out, and all the transactions between User Interface and Database happen.
- It includes interaction between multiple APIs as Well as between API and application program.



What is API Testing Continue….

- In API Testing, instead of using standard user inputs(keyboard) and outputs, API Testing uses software to send calls to the API, get output, and note down the system's response.



- Since APIs lack a GUI, API testing is performed at the message layer and can validate application logic very quickly and effectively.
- API Testing treats the component under test as black box.

What is API Testing Continue….

- API Testing is not a GUI Testing
- It won't concentrate on the look and feel of an application.
- It mainly concentrates on the business logic layer of the software architecture.
- API testing is critical for automation testing and CI/CD process.
- API testing also requires less maintenance effort compare to UI automation testing
- for Web and mobile applications, API often means Web services, and API testing refers to the automation test performed to the Web services.

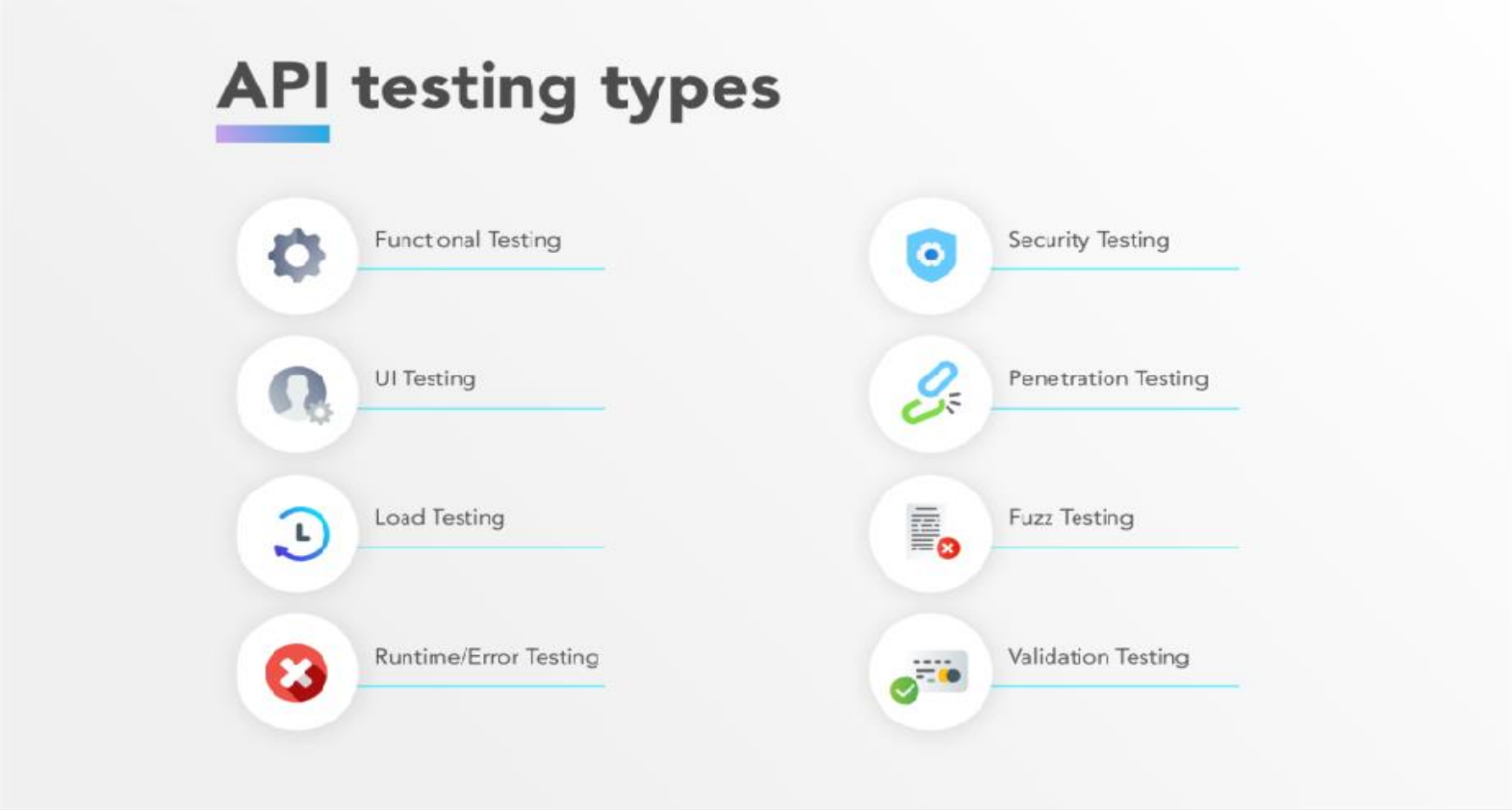
The Benefits of API Testing

API testing is an important activity that testing teams should focus on. It offers a number of advantages over other kinds of testing:

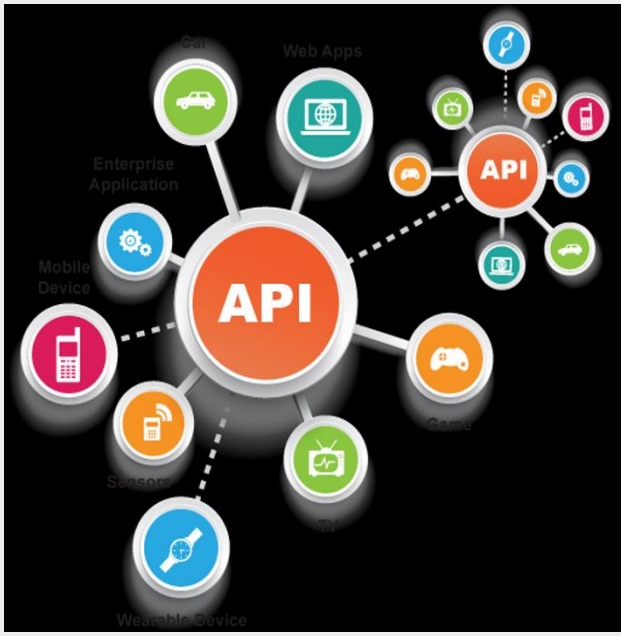
- Earlier Testing
- Easier Test Maintenance
- Faster Time To Resolution
- Speed and Coverage of Testing
- Language independent
- GUI independent
- Improved test coverage
- Faster releases

API testing types

- API testing is generally categorized into common categories below:



API testing best practices



- Test cases should be grouped by test category
- On top of each test, you should include the declarations of the APIs being called.
- Parameters selection should be explicitly in the test case itself
- Prioritize API function calls so that it will be easy for testers to test
- Each test case should be as self-contained and independent from dependencies as possible

- Avoid "test chaining" in your development

API testing best practices Continue....

- Special care must be taken while handling one-time call functions like - Delete, CloseWindow, etc...
- Call sequencing should be performed and well planned
- To ensure complete test coverage, create test cases for all possible input combinations of the API.

Types of Bugs that API testing detects

- Missing or duplicate functionality
- Reliability Issues. Difficulty in connecting and getting a response from API.
- Security Issues
- Multi-threading issues
- Performance Issues. API response time is very high.
- Improper errors/warning to a caller
- Incorrect handling of valid argument values
- Response Data is not structured correctly (JSON or XML)

Challenges in API testing

- Main challenges in Web API testing is Parameter Combination, Parameter Selection, and Call Sequencing
- There is no GUI available to test the application which makes difficult to give input values
- Validating and Verifying the output in a different system is little difficult for testers
- Parameters selection and categorization is required to be known to the testers
- Exception handling function needs to be tested
- Coding knowledge is necessary for testers

Challenges in API testing Continue…

- Initial Setup of API testing
- Update the Schema of API testing
- Validating Parameters
- Tracking System Integration

API testing tools Selection Criteria

Selecting the right API testing tool plays an essential role in the success of a testing project. A suitable API solution can help save plenty of time and budget for the team. There are generally some options to consider:

- Home-grown tools
- Open source tools
- Vendor tools

API Testing Tools

For successfully performing API testing, you will need a tool to structure and manage your test cases. Here are some of the top API testing tools that can be used for Rest API and Soap API:

- SoapUI
- Postman
- Katalon Studio
- Tricentis Tosca
- REST-assured

Summary

- In this lesson, you have learnt:
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  - Why do we need to perform API testing?
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