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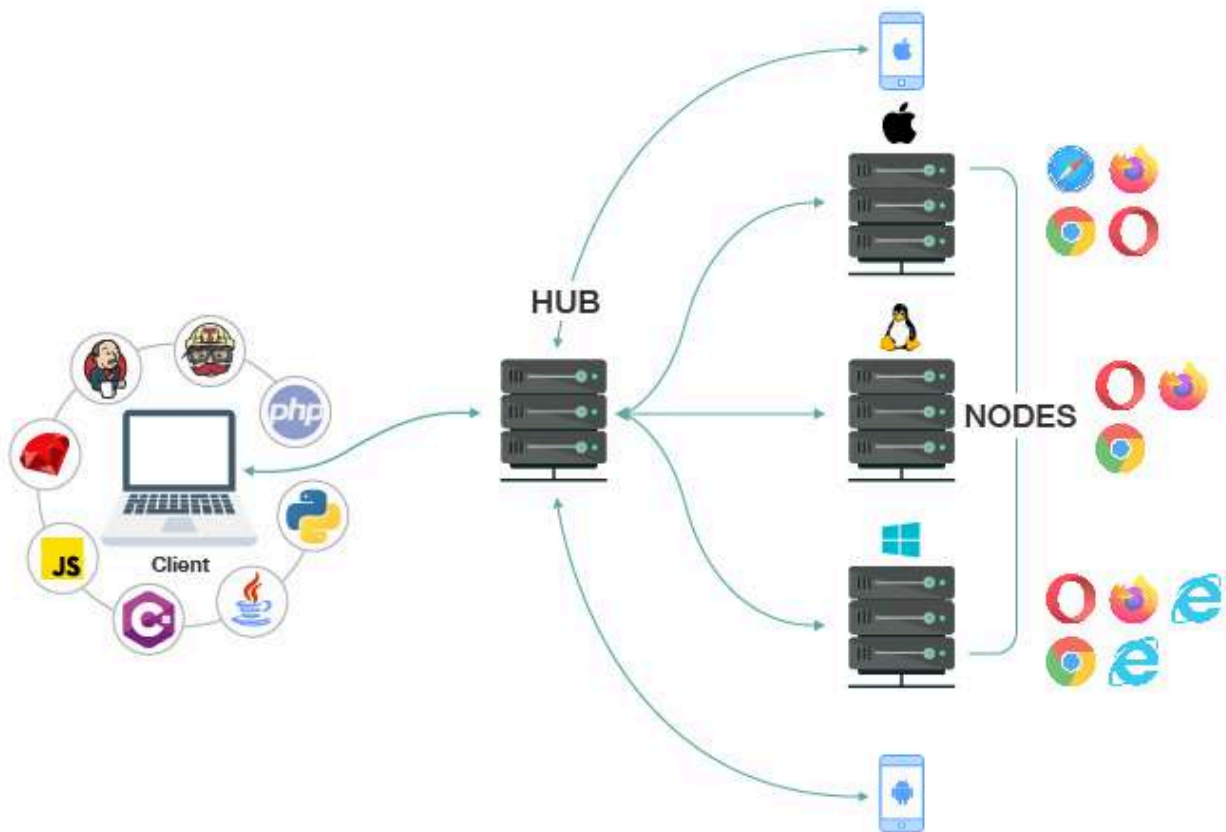


CASE STUDY

Selenium Grid 4 - Architecture and Communication

Anisur 17 Mar 2025 0 375 0

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🚀 What is Selenium Grid?

Selenium Grid is a powerful tool that enables **parallel execution** of tests across multiple browsers, devices, and operating systems. It helps teams run tests faster by distributing them across different machines, improving efficiency and scalability in test automation.

With **Selenium Grid 4**, the traditional Hub-Node model is replaced with a fully **distributed architecture**, making test execution more reliable and flexible.

****Selenium Grid 4 Architecture and Communication****

Real-World Analogy: Selenium Grid 4 as a Ride-Sharing App

Think of Selenium Grid 4 like a ride-sharing app (e.g., Uber). Here's how the components relate:

| ****Selenium Grid 4 Component - Ride-Sharing Analogy |**

| ****Router** - The ride-booking app |**

How it Works in a Ride-Sharing App:

1. A **passenger** (test script) opens the app and requests a ride.
2. The **ride-booking system** (Router) receives the request and forwards it.
3. The **dispatcher** (Distributor) finds an available **driver** (Node).
4. The **ride-tracking system** (Session Map) records the trip.
5. The **driver** (Node) picks up the passenger and completes the ride (executes the test).
6. Once done, the ride-tracking system removes the session, and the driver is free for new requests.

Step-by-Step Breakdown of Selenium Grid 4 Communication

Step 1: The Test Script Sends a Request

- The test script (client) wants to **run a test on Chrome**.
- The script sends a request to the **Router** (like booking a ride).

Step 2: Router Receives the Request

- The **Router** (`http://localhost:4444`) is the **entry point** for all test requests.
- It **does not decide** where the test should run.
- Instead, it **forwards the request** to the **Distributor**.

Step 3: Distributor Assigns a Node

- The **Distributor** looks for an **available Node (browser machine)**.
- It checks:
 - "Do we have a Node that supports Chrome?"
 - "Is that Node free?"
- If a matching Node is available, the **Distributor assigns it**.

Step 4: Session Map Records the Test

- The **Session Map** keeps track of:
 - Which test is running.
 - On which **Node (machine)**.
- The current status of the test.

Step 5: Node Executes the Test

- The **assigned Node (Chrome browser on a machine)** starts running the test.
- It follows all Selenium commands.
- The **Session Map** ensures that the **Router** sends commands to the correct Node.

Step 6: Test Execution Completes

- Once the test is done, the **Node** closes the browser.
- The **Session Map** removes the session from its record.
- The **Node** is now free for the next test.

Key Concepts Summary

- ✓ **No Hub-Node Model** – Selenium Grid 4 replaces Hub-Node with a fully distributed system.

✅ ****Session Map Tracks Tests**** – Ensures that WebDriver commands reach the correct browser.

✅ ****Nodes Execute Tests**** – Multiple Nodes can run different tests simultaneously.

Why This Matters?

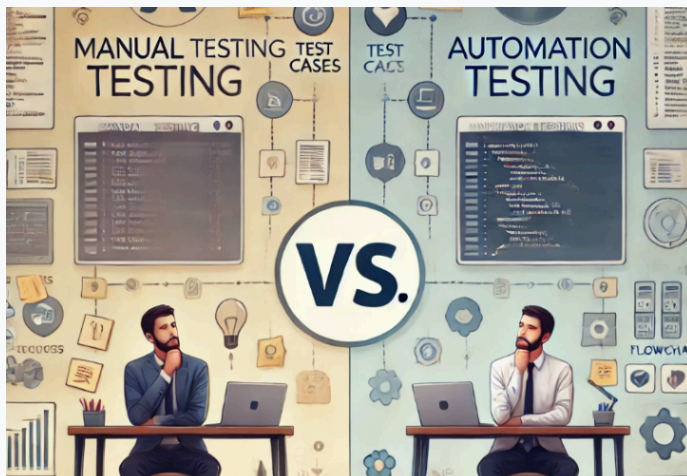
- ****More Scalable**** 🚀 – You can easily add new Nodes without modifying the Grid setup.
- ****More Efficient**** ⚡ – Uses ****event-based communication**** instead of polling.
- ****Easier to Use**** ✅ – A ****single Router URL (`http://localhost:4444/wd/hub`)**** handles everything.

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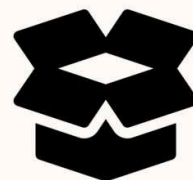
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