**3. From Ant and Maven to Gradle – A Brief History of Build Automation Tools**

**Apache Ant (2000)**

* First widely used Java build tool.
* Used XML for configuration.
* Automated tasks like compile, package, deploy.
* **Problem:** No dependency management, verbose XML, difficult reuse.

**Apache Maven (2004)**

* Improved on Ant with **convention over configuration**.
* Added **dependency management** via repositories.
* Standardized project structures.
* **Problem:** Still rigid, XML-heavy, and slower builds.

**Gradle (2007+)**

* Combines strengths of Ant (flexibility) and Maven (dependency management).
* Uses **Groovy/Kotlin DSL** instead of XML → simpler and more powerful.
* Supports **incremental builds and caching** → much faster.
* Highly **customizable and extensible** with plugins.
* Works with multiple languages and ecosystems (Java, Kotlin, Android, C/C++, etc.).

✅ **In short:**

* **Ant** → Flexible but manual.
* **Maven** → Structured, adds dependencies, but rigid.
* **Gradle** → Modern, fast, flexible, combines both strengths.