



[DB 1-2] 7th Mar. 2023

Consider it very seriously

Database

(Environment Setting)

Spring, 2023

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<https://sites.google.com/view/jack-dfpl/home>

<https://www.youtube.com/channel/UC988e-Y8nto0LXVae0aqaOQ>

Table of Contents

- Environment Setting

Schedule

Week	Title		
1	Course Overview and Environment Setting	Environment Setting and Revisiting Java	-
2	Introduction to Database		CH1
3	Relational Model	Relational Algebra	CH2
4	Relational Algebra		CH2
5	Database Language: SQL (DDL, DML, DQL, DCL)		CH3-5
6	Database Language: SQL (DDL, DML, DQL, DCL)		CH3-5
7	Database Language: SQL (DDL, DML, DQL, DCL)		CH3-5
8	Midterm Examination		
9	Physical Database Design: Indexing		CH12
10	Physical Database Design: Indexing		CH12
11	Conceptual Database Design – E-R Data Model		CH6
12	Logical Database Design 1 – Schema Mapping		CH6
13	Logical Database Design 2 – Normalization		CH7
14	Query Processing and Optimization, or View (TBD)		CH13-14, CH3-5
15	Final Examination		

Subject to change

Calendar

- 수업일수는 요일별 15주 이상이며 수업 결손이 발생하지 않도록 진행

요일별	월	화	수	목	금
수업일수	16일	15일	16일	16일	15일

나. 수업주차 : 한 주차는 목요일부터 수요일까지 임

수업주차	기간	수업주차	기간
1주차	03.02.(목) ~ 03.08.(수)	9주차	04.27.(목) ~ 05.03.(수)
2주차	03.09.(목) ~ 03.15.(수)	10주차	05.04.(목) ~ 05.10.(수)
3주차	03.16.(목) ~ 03.22.(수)	11주차	05.11.(목) ~ 05.17.(수)
4주차	03.23.(목) ~ 03.29.(수)	12주차	05.18.(목) ~ 05.24.(수)
5주차	03.30.(목) ~ 04.05.(수)	13주차	05.25.(목) ~ 05.31.(수)
6주차	04.06.(목) ~ 04.12.(수)	14주차	06.01.(목) ~ 06.07.(수)
7주차	04.13.(목) ~ 04.19.(수)	15주차	06.08.(목) ~ 06.14.(수)
8주차 (중간고사)	04.20.(목) ~ 04.26.(수)	16주차 (기말고사)	06.15.(목) ~ 06.21.(수)

Calendar

2023년 3월. March

S	M	T	W	T	F	S
1				1	2	3
2	5	6	7	8	9	10
3	11	12	13	14	15	16
4	17	18	19	20	21	22
5	23	24	25	26	27	28
	29	30	31			

- 2(목)
- 3(금) - 8(수)
- 6(월) - 15(수)
- 24(금) - 28(화)

1학기 개강
수강신청 과목 확인 및 변경
교직신청
수강신청과목 철회

Calendar

2023년 4월. April

S	M	T	W	T	F	S
						1
5						1
6	2	3	4	5	6	7
7	9	10	11	12	13	14
8중간	16	17	18	19	20	21
9	23	24	25	26	27	28
10	30					

• 20(목) - 26(수)

1학기 중간고사

• 27(목) - 5.1(월)

1학기 중간고사 성적 입력

IEEE ICDE 2023, Anaheim, California, US

Calendar

2023년 5월. May

	S	M	T	W	T	F	S
10		1	2	3	4	5	6
11	7	8	9	10	11	12	13
12	14	15	16	17	18	19	20
13	21	22	23	24	25	26	27
14	28	29	30	31			

- 2(화) - 7(일)
- 4(목) - 30(화)
- 5(금)
- 29(월) - 31(수)

1학기 중간고사 성적 열람 및 정정
복수·부전공, 연계융합전공 신청
창립 83주년 기념휴일 (창립일 : 1940. 5. 20)
하계 계절학기 수강신청

Calendar

2023년 6월. June

S	M	T	W	T	F	S
				1	2	3
14						
15	4	5	6	7	8	9 10
기말	11 12 13 14 15 16 17	18 19 20 21 22 23 24	25 26 27 28 29 30			

- 9(금) - 26(월) 1학기 강의평가
- 15(목) - 21(수) 1학기 기말고사 및 수업결손 보충
- 22(목) - 26(월) 1학기 기말고사 성적 입력
- 22(목) 하계방학 시작 및 계절학기 개강
- 27(화) - 7.3(월) 1학기 기말고사 성적 열람 및 정정

Calendar

2023년 7월. July

S	M	T	W	T	F	S
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31					

• 4(화) - 5(수)

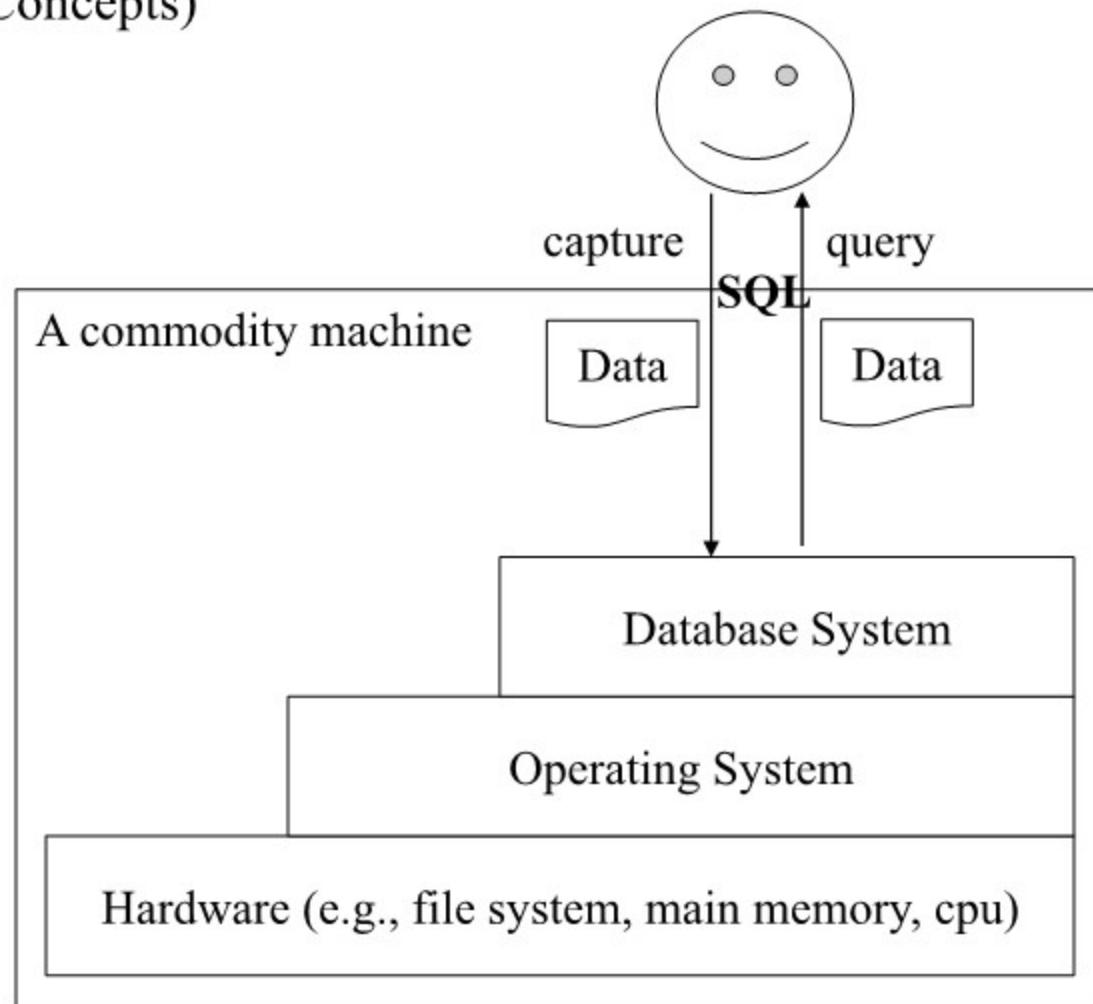
1학기 기말고사 성적마감

• 24(월) - 30(일)

2학기 복학, 휴학 신청

Introduction to Database

- Why do we learn SQL?
 - Example: a table of contents (Database System Concepts)
 - 제11장: 저장과 파일 구조
 - 제12장: 인덱싱과 해싱
 - 제13장: 질의 처리
 - 제15장: 트랜잭션
 - 제16장: 동시성 제어
 - 제17장: 복구 시스템
 - 제21장: 병렬 DB
 - 제22장: 분산 DB



Preparation

- MariaDB (<https://www.slideshare.net/GOTOSatoru/introduction-of-mariadb-2017-09>)
 - Open-source relational database management system
 - Efficient than MySQL
 - Query optimizer enhancements
 - Fast and safer replication
 - Thread pool
 - Allows 200,000+ connections
 - Extensions

Preparation

- MariaDB

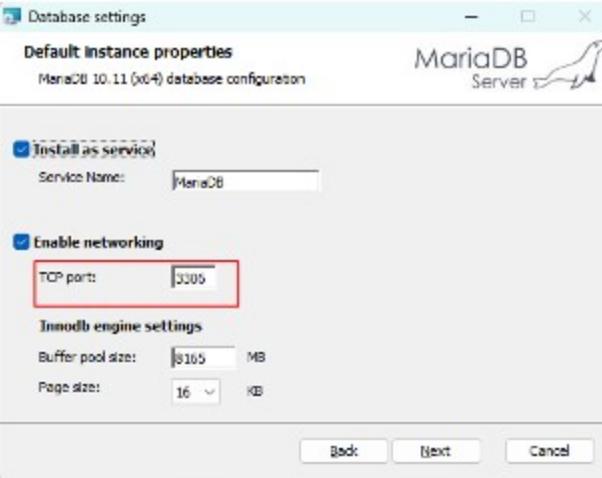
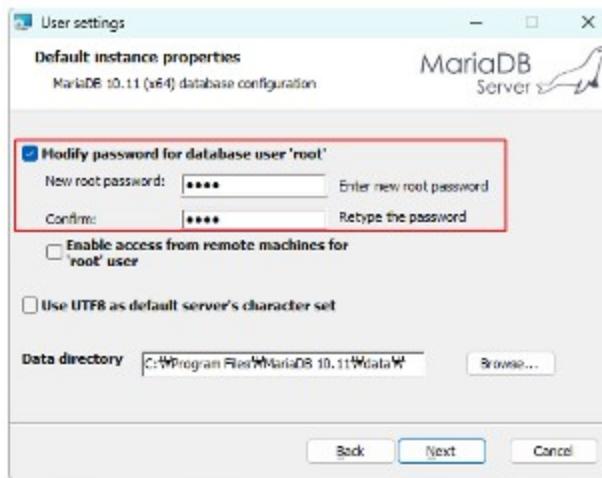
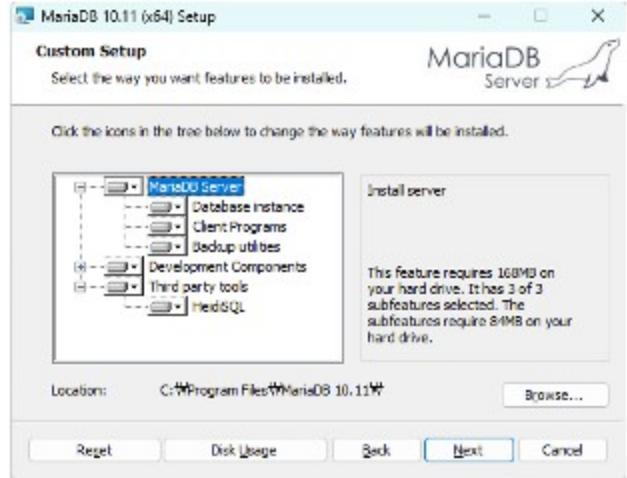
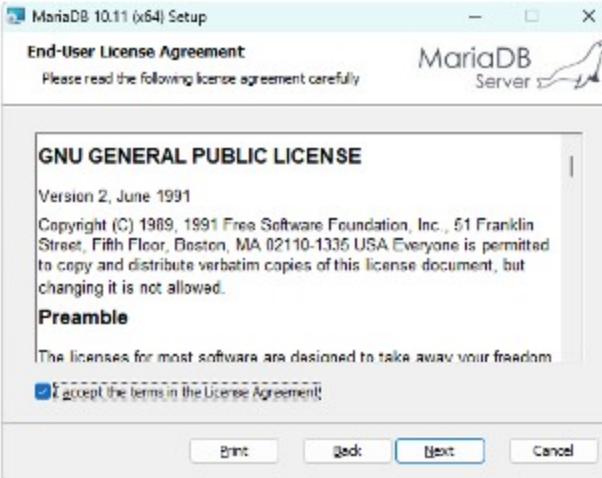
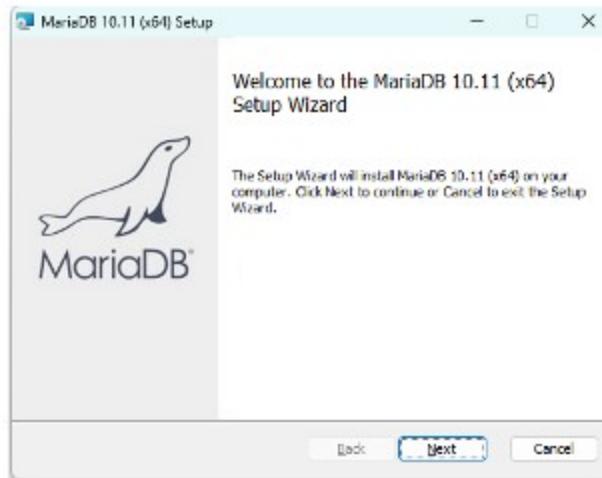
- <https://mariadb.org/>
- <https://mariadb.org/download/>

The screenshot shows a search interface for MariaDB Server. At the top, there are three tabs: "MariaDB Server" (selected), "MariaDB Repositories", and "Connectors". Below the tabs, the "MariaDB Server Version" dropdown is set to "MariaDB Server 10.11.2". There is also a checkbox labeled "Display older releases: ". The "Operating System" dropdown is set to "Windows". The "Architecture" dropdown is set to "x86_64". The "Package Type" dropdown is set to "MSI Package". At the bottom left, there is a blue button labeled "Download". To the right of the download button is a "Mirror" dropdown, which is currently set to "Alibaba Cloud".

MAC OS
<https://mariadb.com/kb/ko/installing-mariadb-on-macos-using-homebrew/>

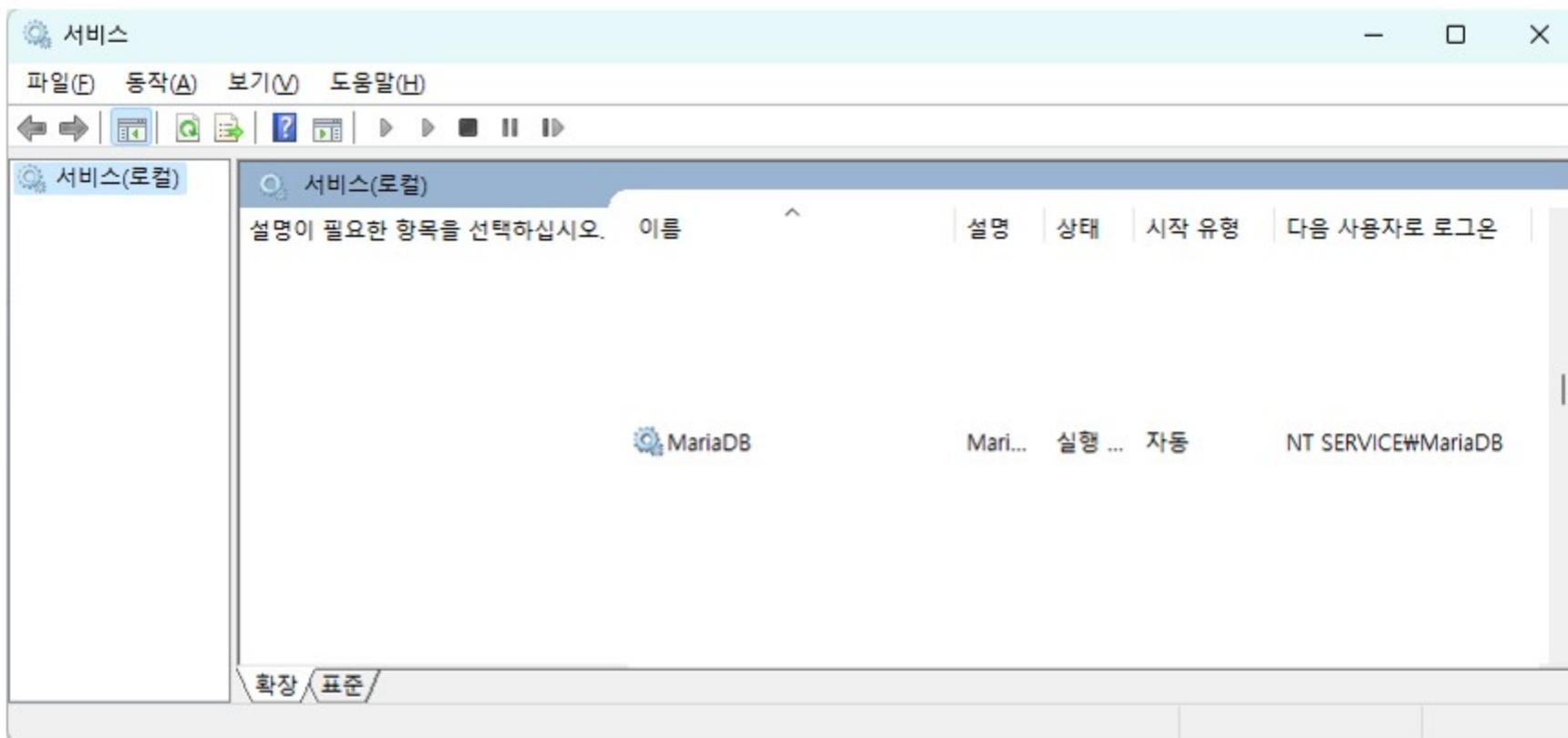
Preparation

- MariaDB
 - Click msi file to install MariaDB



Preparation

- MariaDB
 - Check MariaDB service is running
 - Windows Key → Service (서비스)



Preparation

- MariaDB
 - Windows key → launch MySQL Client

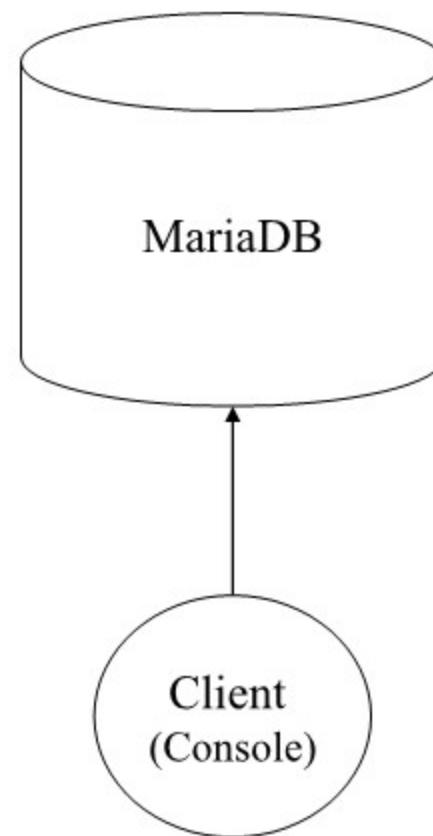
The screenshot shows the MySQL Client (MariaDB 10.11) window. The title bar reads "MySQL Client (MariaDB 10.11 (x64))". The main pane displays the following text:

```
Enter password: ****
Welcome to the MariaDB monitor. Commands end with ; or \g.
Your MariaDB connection id is 3
Server version: 10.11.2-MariaDB mariadb.org binary distribution

Copyright (c) 2000, 2018, Oracle, MariaDB Corporation Ab and others.

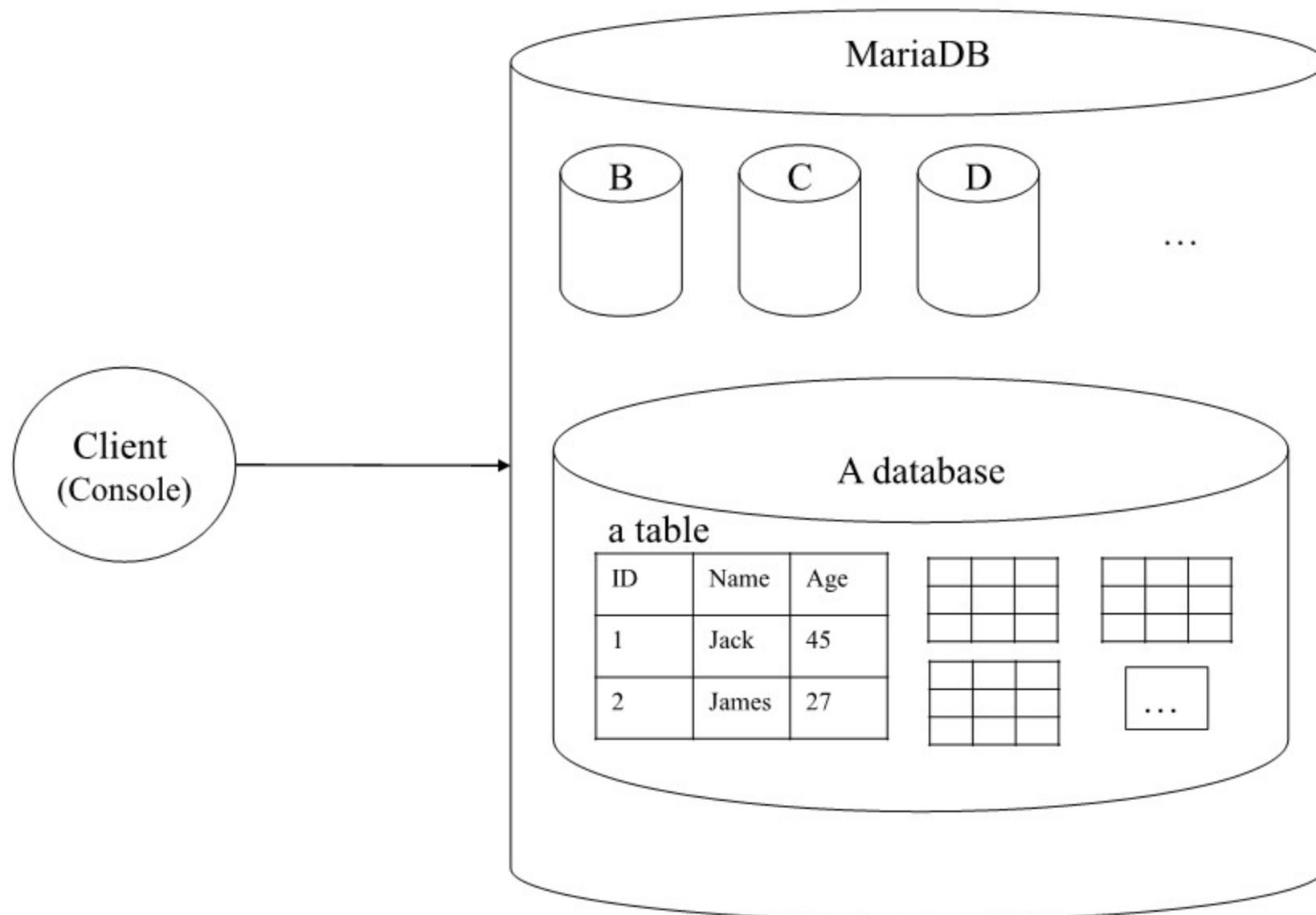
Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.

MariaDB [(none)]> |
```



Preparation

- MariaDB
 - Warming-up



Preparation

- MariaDB
 - Create ‘A’ database
 - > CREATE DATABASE A;

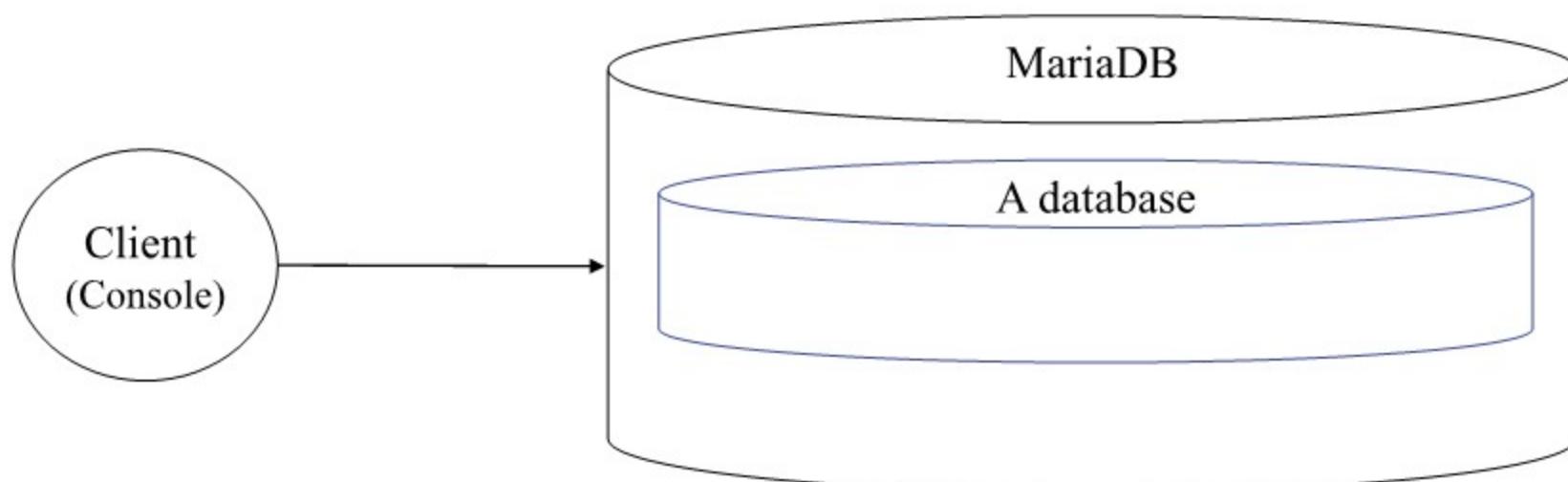
```
MySQL Client (MariaDB 10.5 (x64)) - "C:\Program Files\MariaDB 10.5\bin\mysql.exe" ... - X
Enter password: ****
Welcome to the MariaDB monitor. Commands end with ; or \g.
Your MariaDB connection id is 7
Server version: 10.5.5-MariaDB mariadb.org binary distribution

Copyright (c) 2000, 2018, Oracle, MariaDB Corporation Ab and others.

Type 'help;' or '\h' for help. Type '\w' to clear the current input statement.

MariaDB [(none)]> CREATE DATABASE A;
Query OK, 1 row affected (0.001 sec)

MariaDB [(none)]>
```



Preparation

- MariaDB
 - Use 'A' database
 - > USE A;

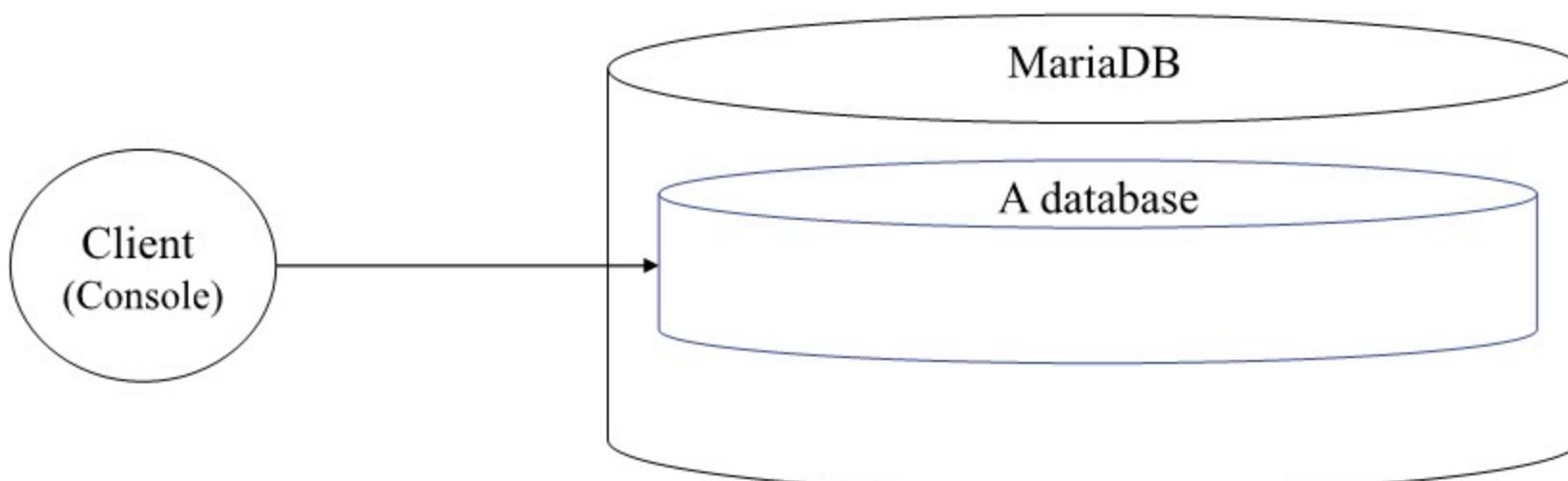
```
MySQL Client (MariaDB 10.5 (x64)) - "C:\Program Files\MariaDB 10.5\bin\mysql.exe" ... - X
Welcome to the MariaDB monitor. Commands end with ; or \g.
Your MariaDB connection id is 7
Server version: 10.5.5-MariaDB mariadb.org binary distribution

Copyright (c) 2000, 2018, Oracle, MariaDB Corporation Ab and others.

Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.

MariaDB [(none)]> CREATE DATABASE A;
Query OK, 1 row affected (0.001 sec)

MariaDB [(none)]> USE A;
Database changed
MariaDB [A]> -
```

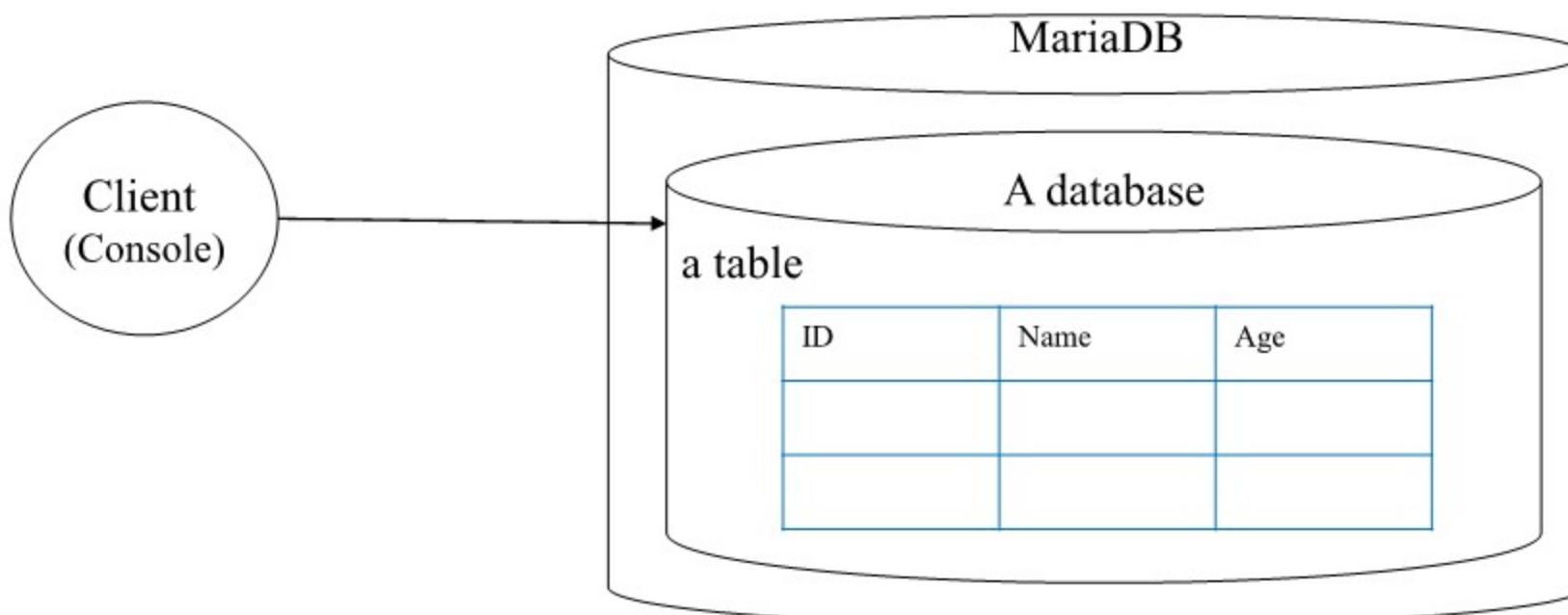


Preparation

- MariaDB
 - Create ‘a’ table
 - ID: String
 - Name: String
 - Age: Integer

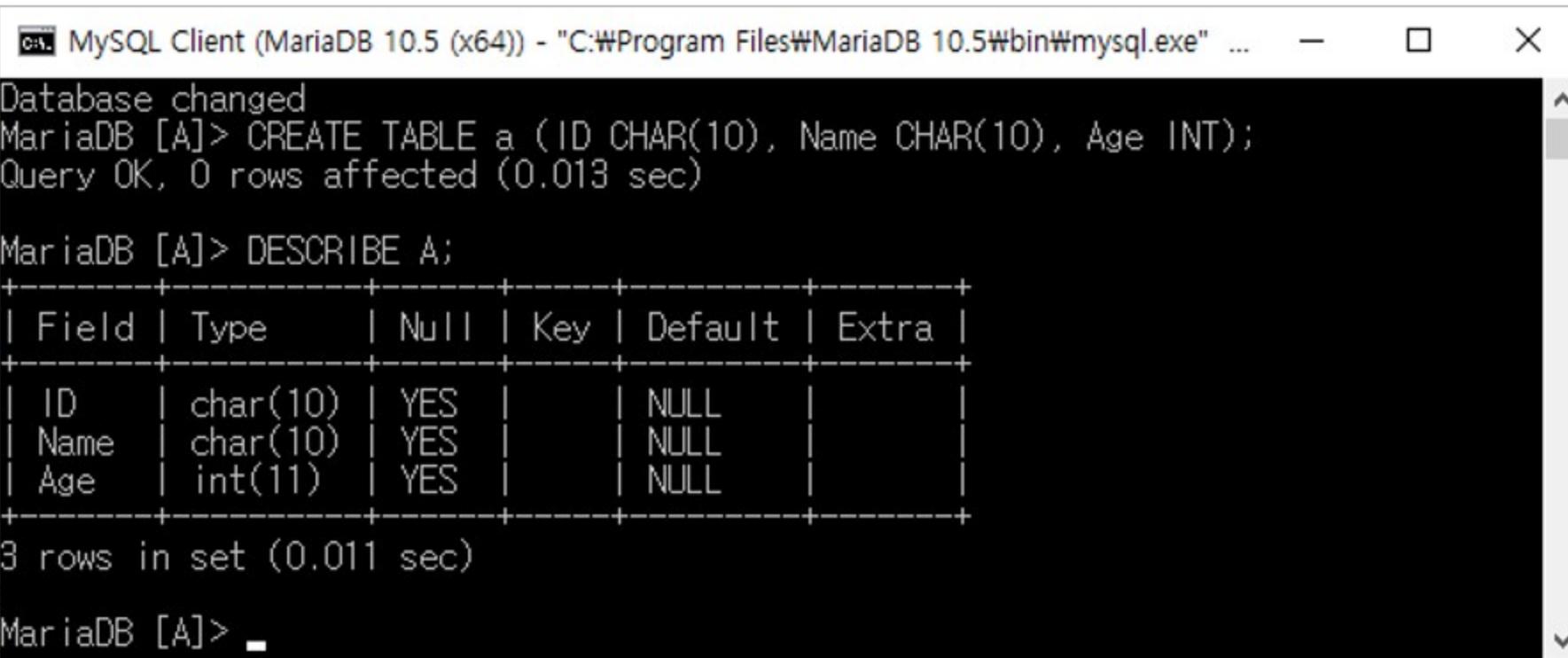
```
MySQL Client (MariaDB 10.5 (x64)) - "C:\Program Files\MariaDB 10.5\bin\mysql.exe" ... - □ ×  
Server version: 10.5.5-MariaDB mariadb.org binary distribution  
Copyright (c) 2000, 2018, Oracle, MariaDB Corporation Ab and others.  
Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.  
MariaDB [(none)]> CREATE DATABASE A;  
Query OK, 1 row affected (0.001 sec)  
MariaDB [(none)]> USE A;  
Database changed  
MariaDB [A]> CREATE TABLE a (ID CHAR(10), Name CHAR(10), Age INT);  
Query OK, 0 rows affected (0.019 sec)  
MariaDB [A]> -
```

> CREATE TABLE a
(ID CHAR(10), Name CHAR(10), Age INT);



Preparation

- MariaDB
 - See the description of ‘a’ table
 - > DESCRIBE a;



The screenshot shows a terminal window titled "MySQL Client (MariaDB 10.5 (x64)) - "C:\Program Files\MariaDB 10.5\bin\mysql.exe" ...". The window displays the following SQL session:

```
Database changed
MariaDB [A]> CREATE TABLE a (ID CHAR(10), Name CHAR(10), Age INT);
Query OK, 0 rows affected (0.013 sec)

MariaDB [A]> DESCRIBE A;
+-----+-----+-----+-----+
| Field | Type   | Null | Key  | Default | Extra |
+-----+-----+-----+-----+
| ID    | char(10) | YES  |      | NULL    |          |
| Name  | char(10) | YES  |      | NULL    |          |
| Age   | int(11)  | YES  |      | NULL    |          |
+-----+-----+-----+-----+
3 rows in set (0.011 sec)

MariaDB [A]> ■
```

Preparation

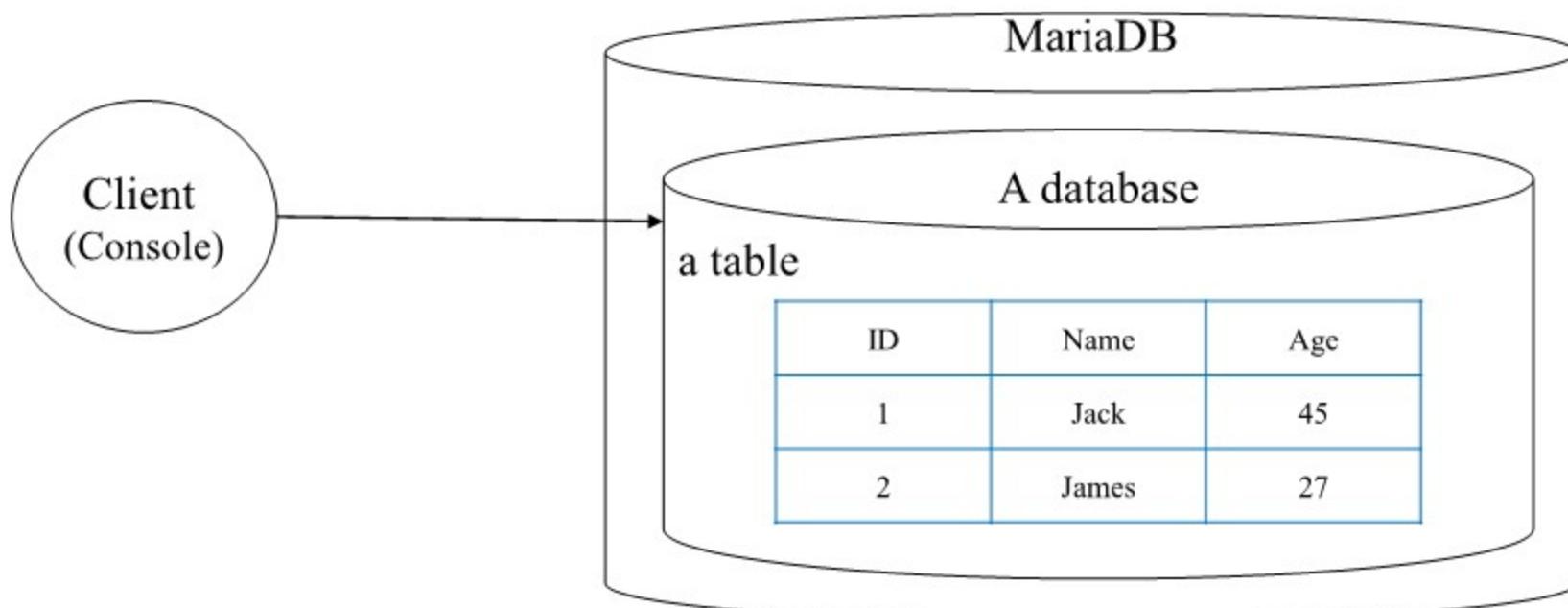
- MariaDB
 - Insert two row into a table
 - > INSERT INTO a VALUES (“1”, “Jack”, 45);
 - > INSERT INTO a VALUES (“2”, “James”, 27);

```
MySQL Client (MariaDB 10.5 (x64)) - "C:\Program Files\MariaDB 10.5\bin\mysql.exe" ... - X
+-----+-----+-----+-----+-----+-----+
| Field | Type   | Null  | Key   | Default | Extra   |
+-----+-----+-----+-----+-----+-----+
| ID    | char(10) | YES   |       | NULL    |          |
| Name  | char(10)  | YES   |       | NULL    |          |
| Age   | int(11)   | YES   |       | NULL    |          |
+-----+-----+-----+-----+-----+-----+
3 rows in set (0.011 sec)

MariaDB [A]> INSERT INTO a VALUES (1, "Jack", 45);
Query OK, 1 row affected (0.005 sec)

MariaDB [A]> INSERT INTO a VALUES (2, "James", 27);
Query OK, 1 row affected (0.001 sec)

MariaDB [A]>
```



Preparation

- MariaDB
 - Query a table

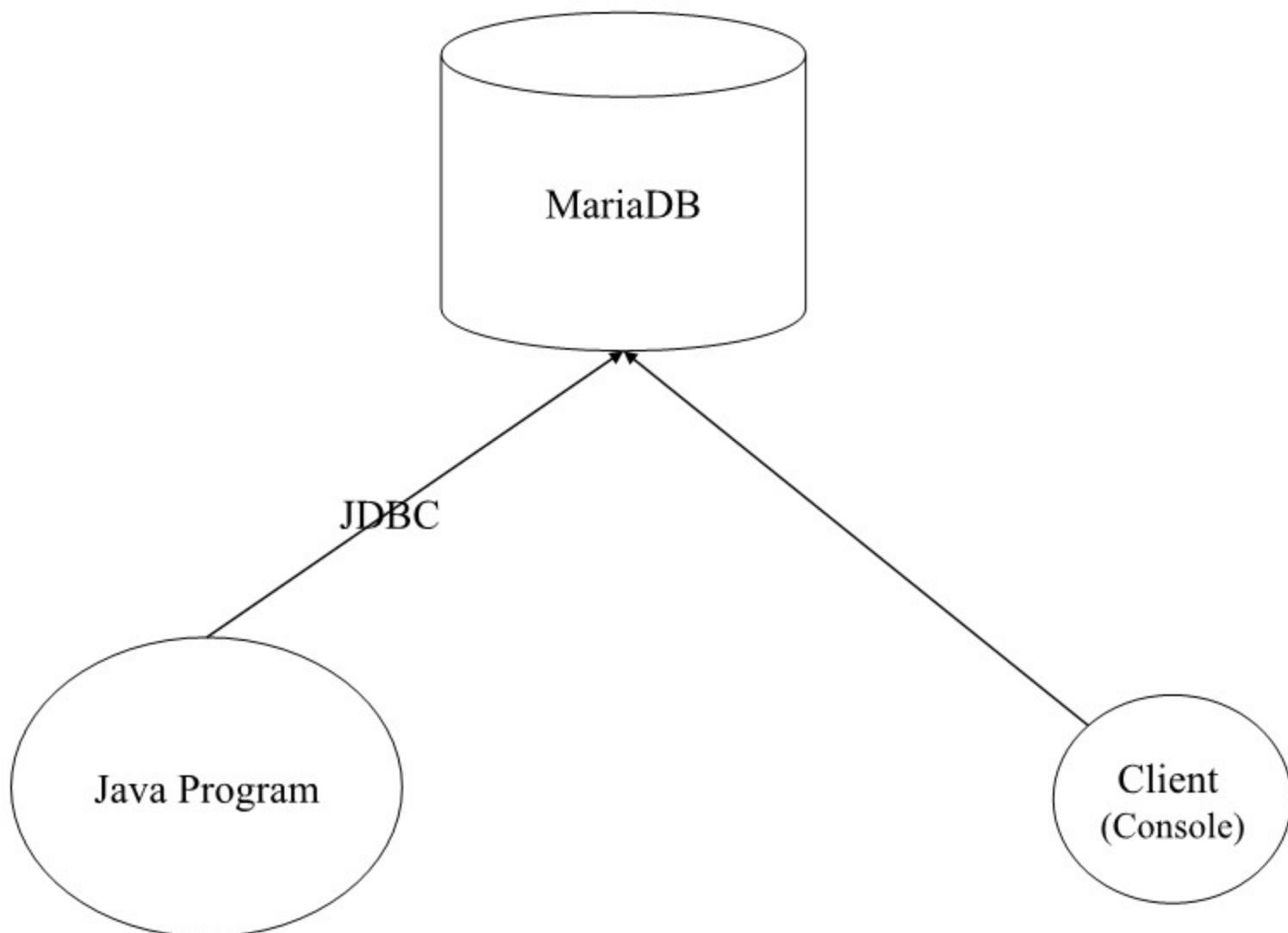
```
MariaDB [A]> SELECT * FROM a;
+----+----+----+
| ID | Name | Age |
+----+----+----+
| 1  | Jack |   45 |
| 2  | James |  27 |
+----+----+----+
2 rows in set (0.000 sec)
```

```
MariaDB [A]> SELECT Age FROM a WHERE Name='Jack';
+----+
| Age |
+----+
| 45 |
+----+
1 row in set (0.000 sec)

MariaDB [A]>
```

Preparation

- Java



Preparation

- Open JDK 19
- Eclipse IDE
 - Integrated Development Environment (IDE)
 - provides comprehensive facilities to computer programmers
 - Source code editor
 - Build automation tools
 - Debugger
 - ...
- Maven
 - Software project management and comprehension tool
 - Manages a project's build, reporting and documentation

Preparation

- Open JDK 19

- <https://jdk.java.net/19/>
- Windows/x64

OpenJDK JDK 19.0.2 General-Availability Release

This page provides production-ready open-source builds of the Java Development Kit, version 19, an implementation of the Java SE 19 Platform under the GNU General Public License, version 2, with the Classpath Exception.

Commercial builds of JDK 19.0.2 from Oracle, under a non-open-source license, can be found at the Oracle Technology Network.

Documentation

- Features
- Release notes
- API Javadoc

Builds

Linux/AArch64	tar.gz (sha256)	194649390 bytes
Linux/x64	tar.gz (sha256)	195931906
macOS/AArch64	tar.gz (sha256)	190625723
macOS/x64	tar.gz (sha256)	192580989
Windows/x64	zip (sha256)	194455638

Notes

- If you have difficulty downloading any of these files please contact download-help@openjdk.org.

Feedback

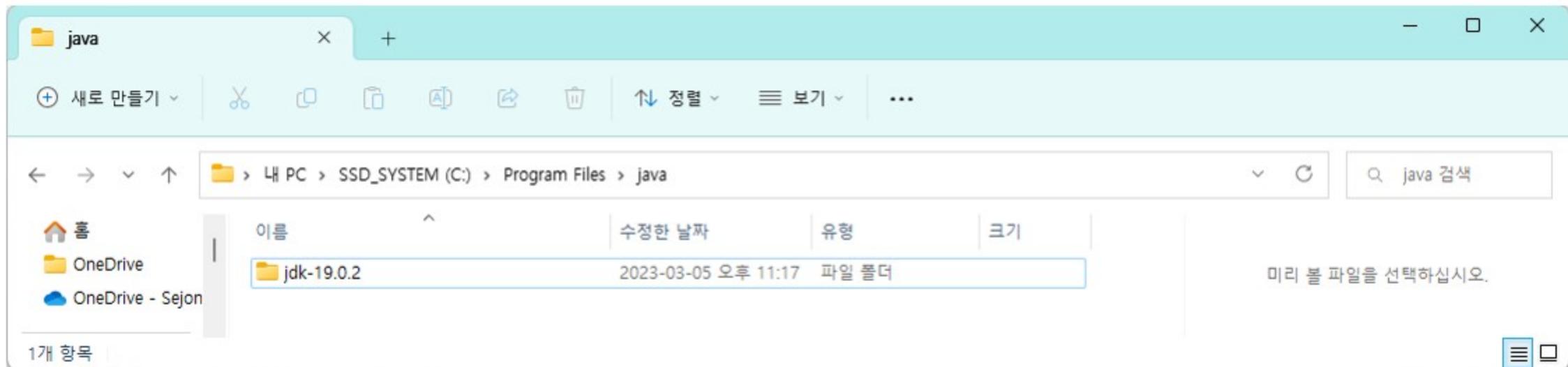
If you have suggestions or encounter bugs, please submit them using the usual Java SE bug-reporting channel. Be sure to include complete version information from the output of the `java --version` command.

International use restrictions

Due to limited intellectual property protection and enforcement in certain countries, the source code may only be distributed to an authorized list of countries. You will not be able to access the source code if you are downloading from a country that is not on this list. We are continuously reviewing this list for addition of other countries.

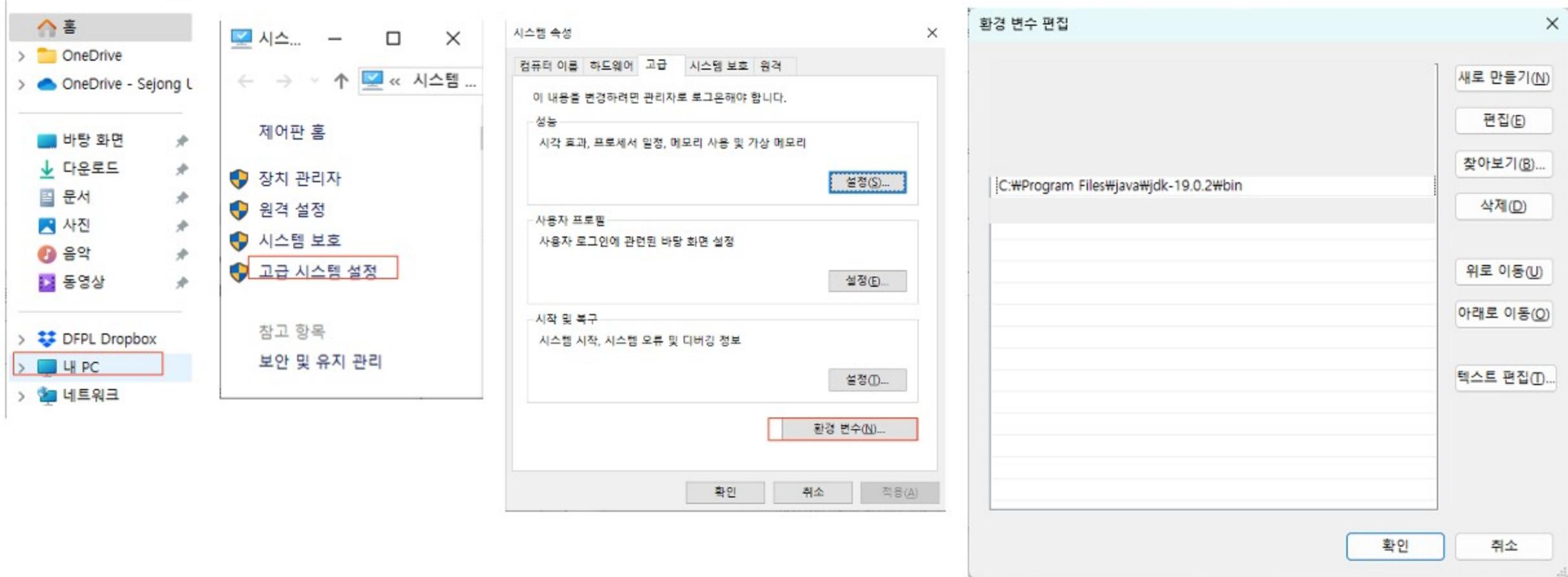
Preparation

- Open JDK 19
 - Unzip



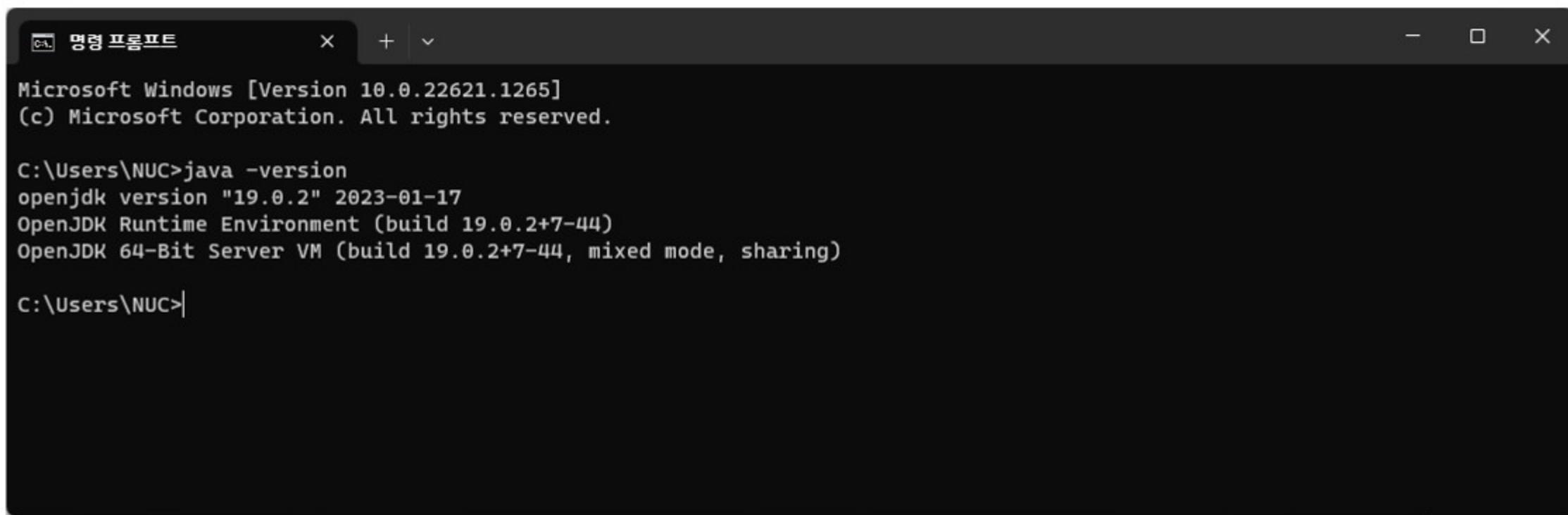
Preparation

- Open JDK 17
 - Environment Setting
 - 내 PC → 속성 → 고급 시스템 설정 → 환경변수 → 시스템 변수 → Path 더블 클릭 → 새로 만들기 → bin 폴더 추가



Preparation

- Open JDK 19
 - Check
 - CMD
 - Window key → cmd → enter



A screenshot of a Windows Command Prompt window titled "명령 프롬프트". The window shows the following text output:

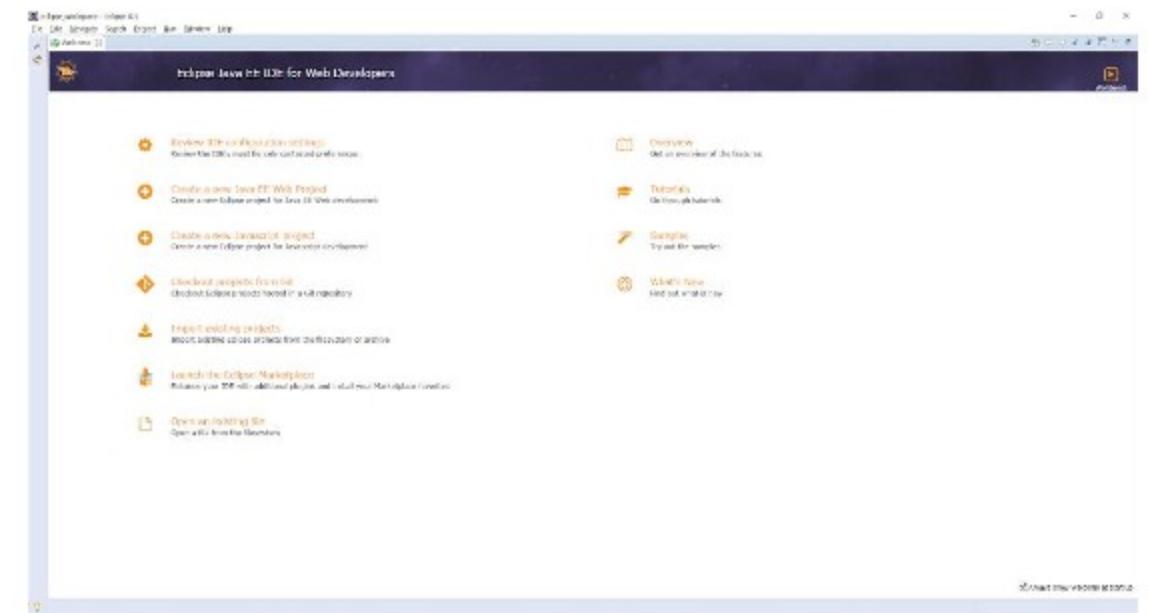
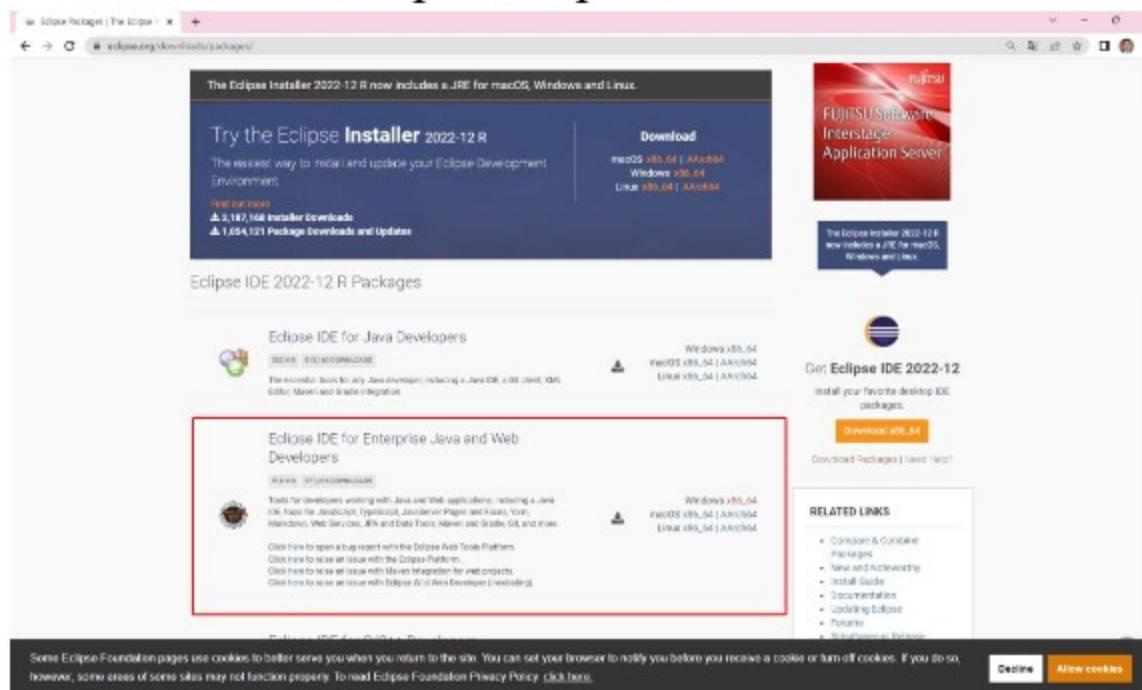
```
Microsoft Windows [Version 10.0.22621.1265]
(c) Microsoft Corporation. All rights reserved.

C:\Users\NUC>java -version
openjdk version "19.0.2" 2023-01-17
OpenJDK Runtime Environment (build 19.0.2+7-44)
OpenJDK 64-Bit Server VM (build 19.0.2+7-44, mixed mode, sharing)

C:\Users\NUC>
```

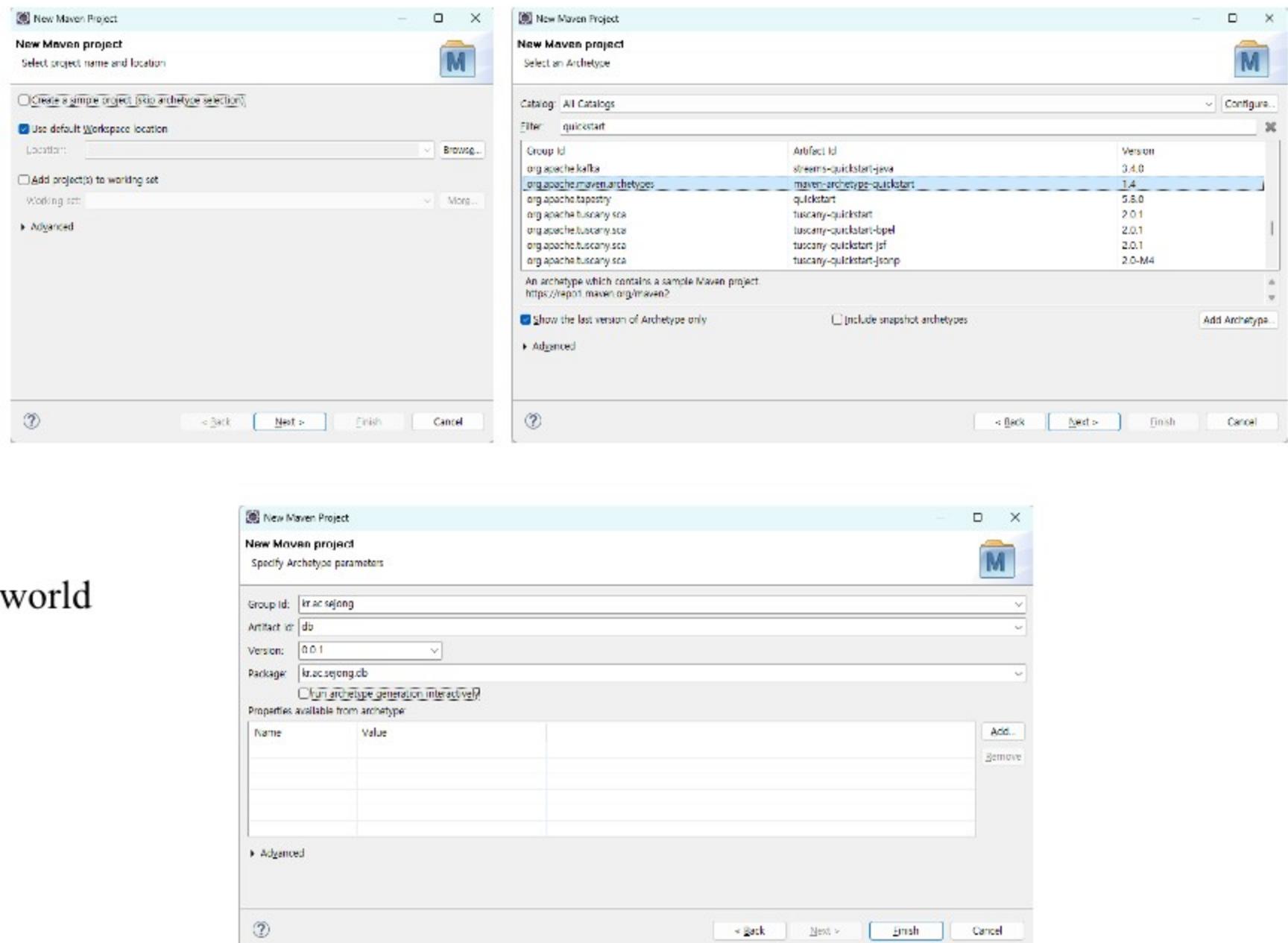
Preparation

- Install Eclipse IDE
 - Download **latest** Eclipse IDE for Java EE Developers (Releases 2022-12R supports JDK19)
 - <http://www.eclipse.org/downloads/packages/>
 - Windows 64-bit
 - Eclipse IDE for Enterprise Java Developers
 - Unzip the file to any folder (e.g., E:\eclipse)
 - Execute E:\eclipse\eclipse.exe



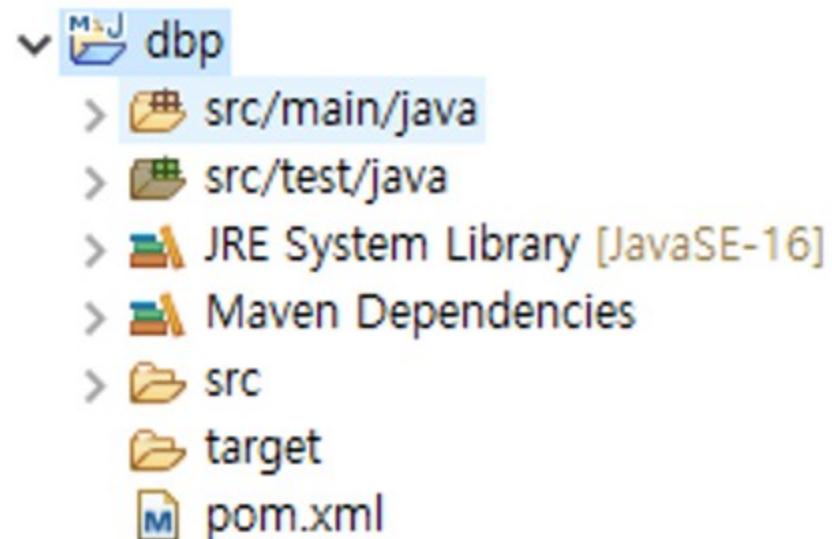
First Application

- File → New → Maven Project
- New Maven project
 - Maven-archetype-quickstart
- Group id
 - kr.ac.sejong.db
- Artifact id
 - helloworld
- Version
 - 0.0.1
- Package → kr.ac.sejong.db.helloworld



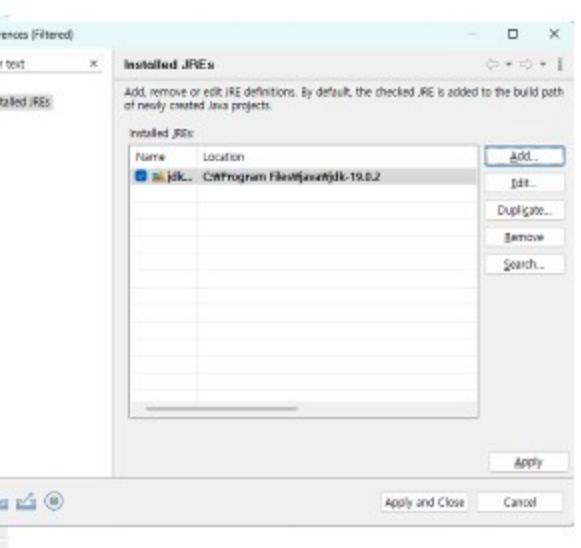
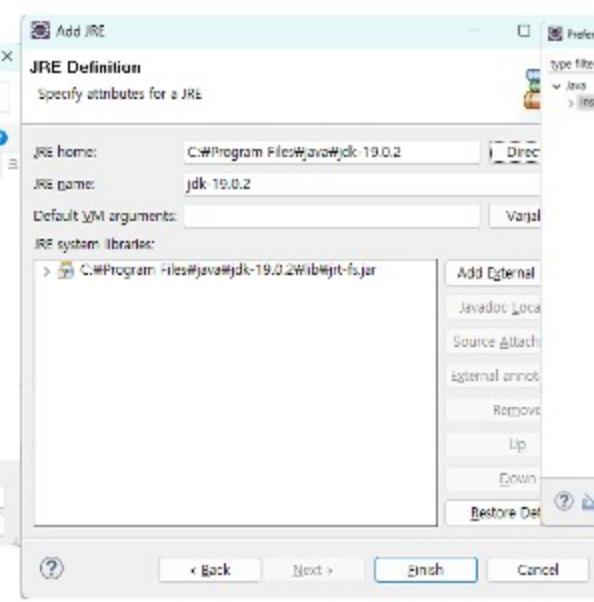
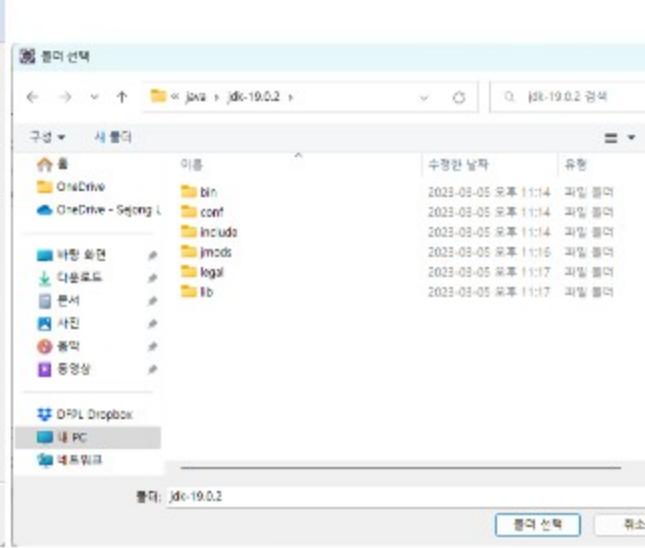
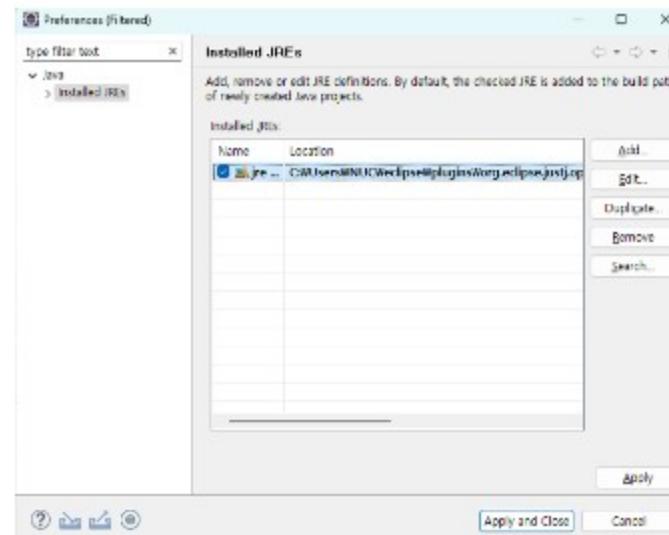
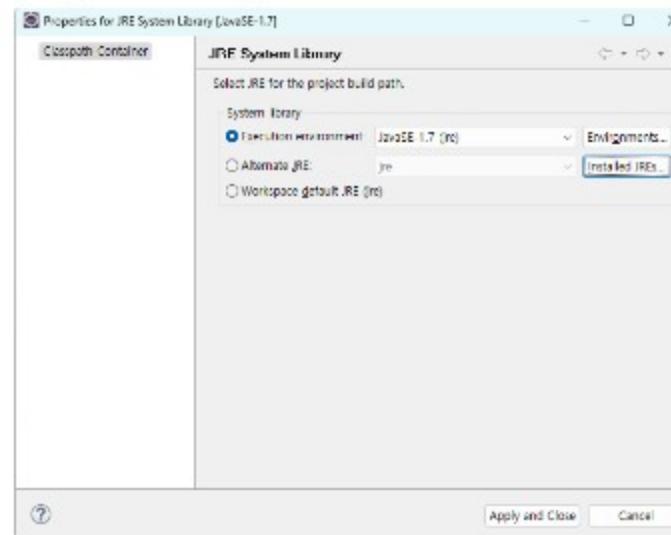
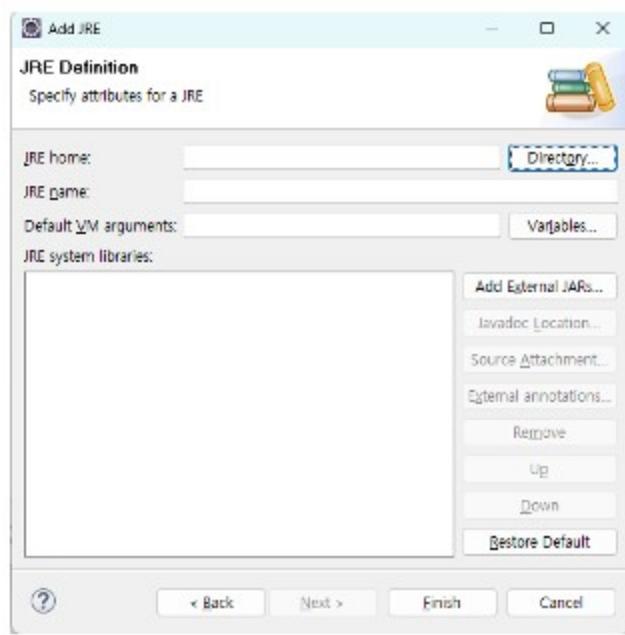
First Application

- pom.xml file in Maven project
 - Feel
 - <properties>
 - <project.build.sourceEncoding>UTF-8</project.build.sourceEncoding>
 - <maven.compiler.source>19</maven.compiler.source>
 - <maven.compiler.target>19</maven.compiler.target>
 - </properties>
 - try **ctrl + space** and see the magic
 - Right click for helloworld → Maven → Update Project
 - See JRE System Library changed
 - If jre is used, change it to jdk



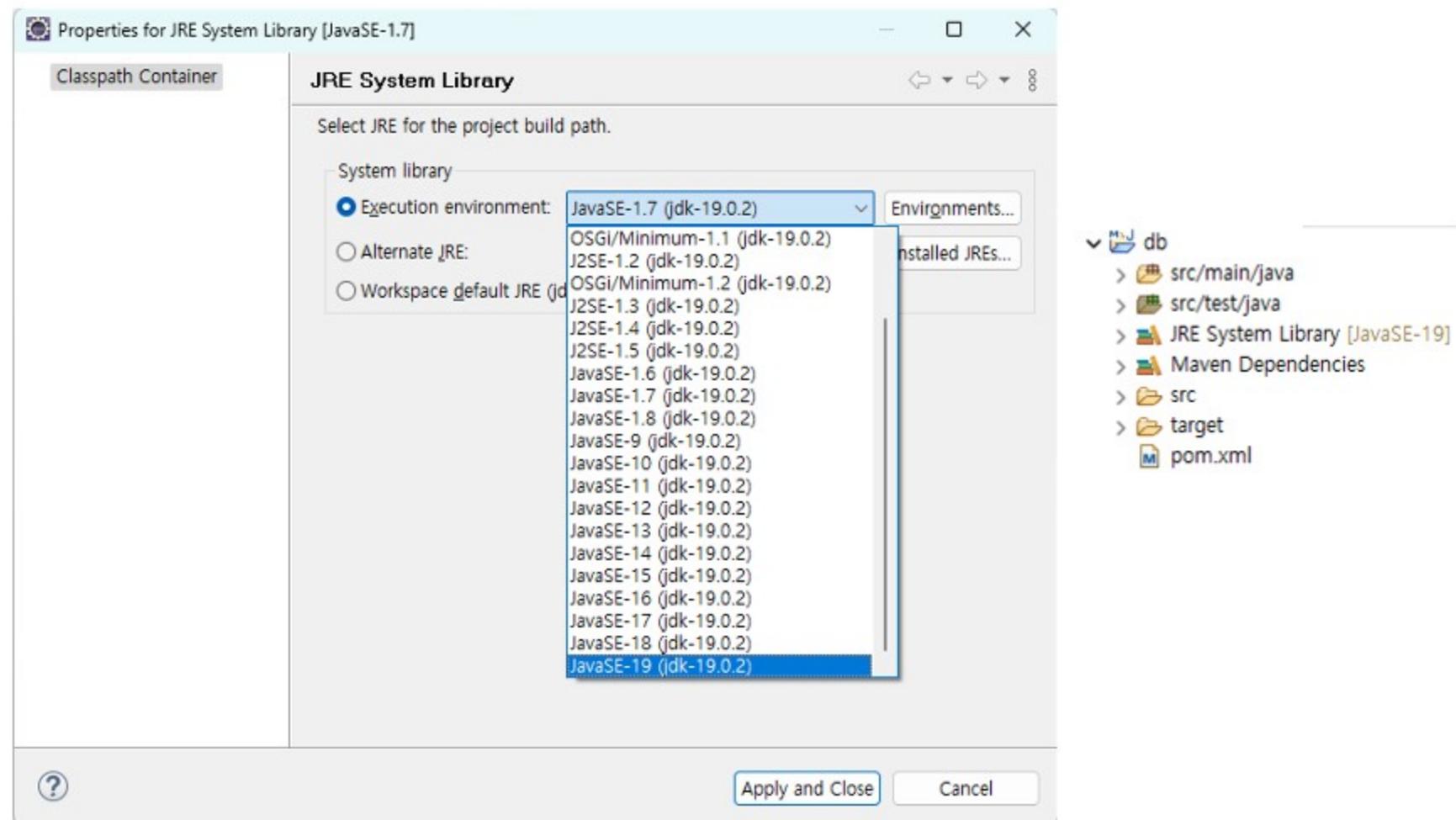
First Application

- Right click of JRE System Library → Properties
- Installed JREs
- Add
- Standard VM
- Set JRE home as jdk folder
- Finish



First Application

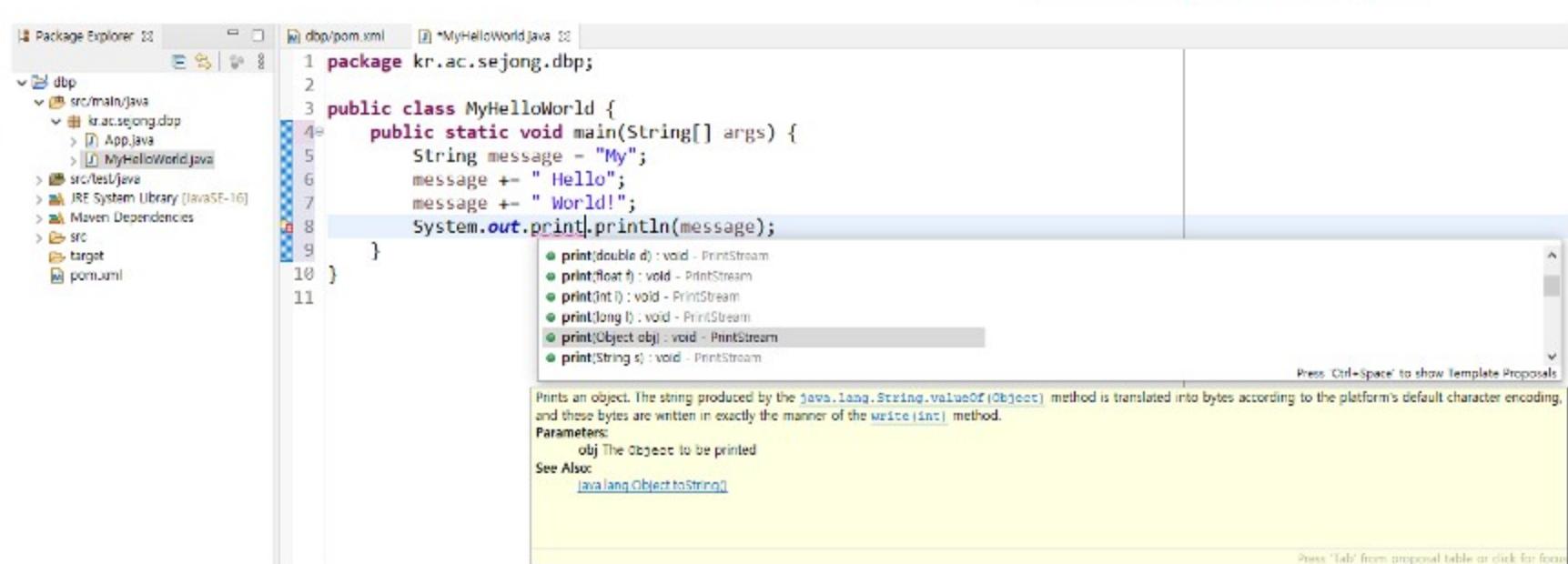
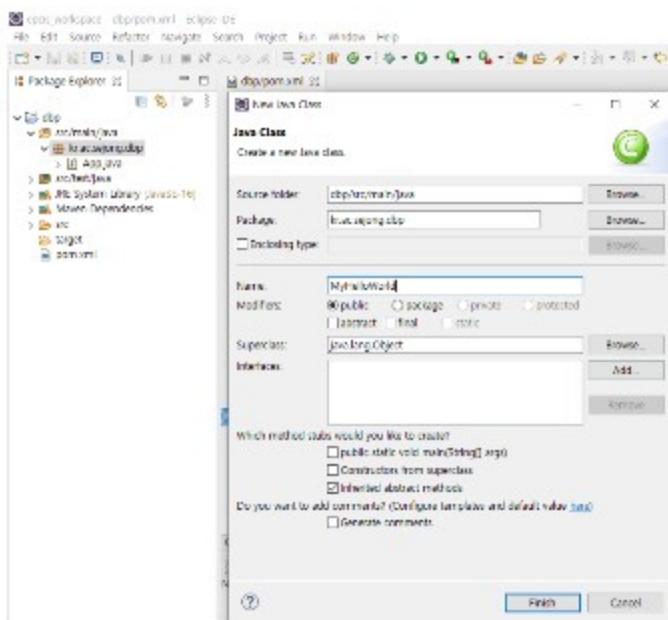
- Right click of JRE System Library → Properties
- Installed JREs
- Add
- Standard VM
- Set JRE home as jdk folder
- Finish



First Application

- Right click of package kr.ac.sejong.dbp.helloworld → New → Class
- Create MyHelloWorld with public static void main

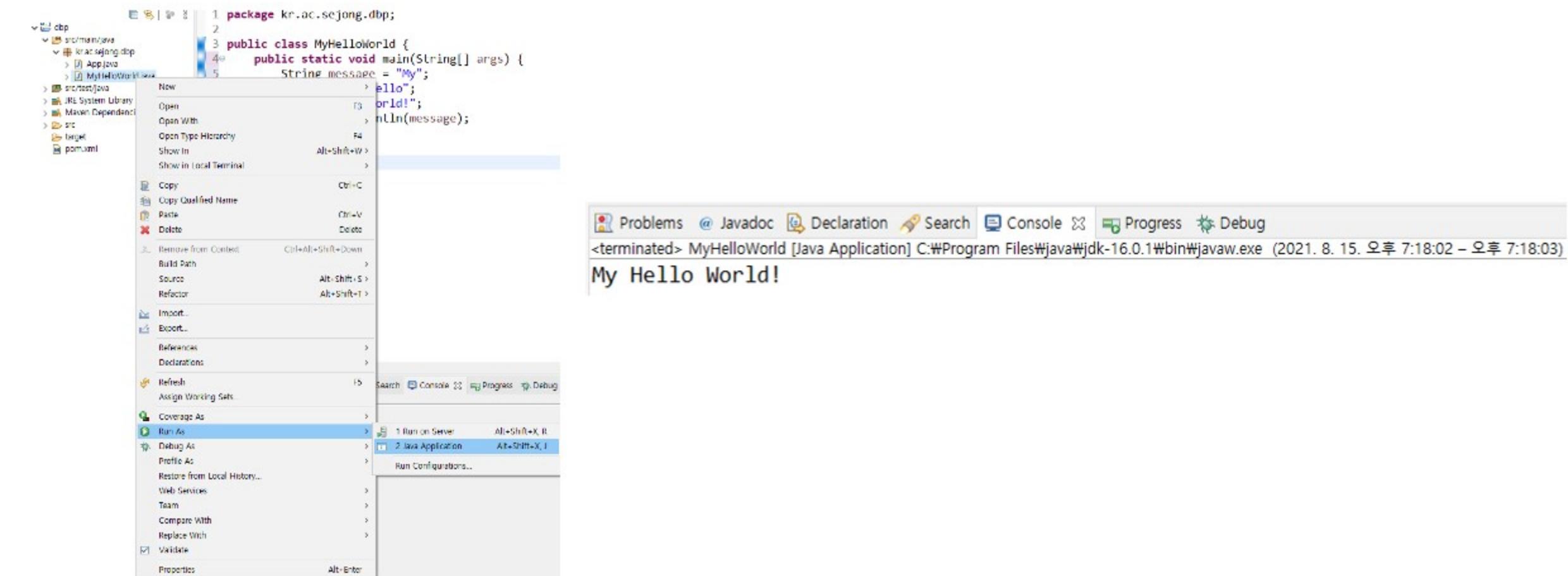
```
public class MyHelloWorld {  
    public static void main(String[] args) {  
        String message = "My";  
        message += " Hello";  
        message += " World!";  
        System.out.println(message);  
    }  
}
```



- HINT
- DOCUMENTATION

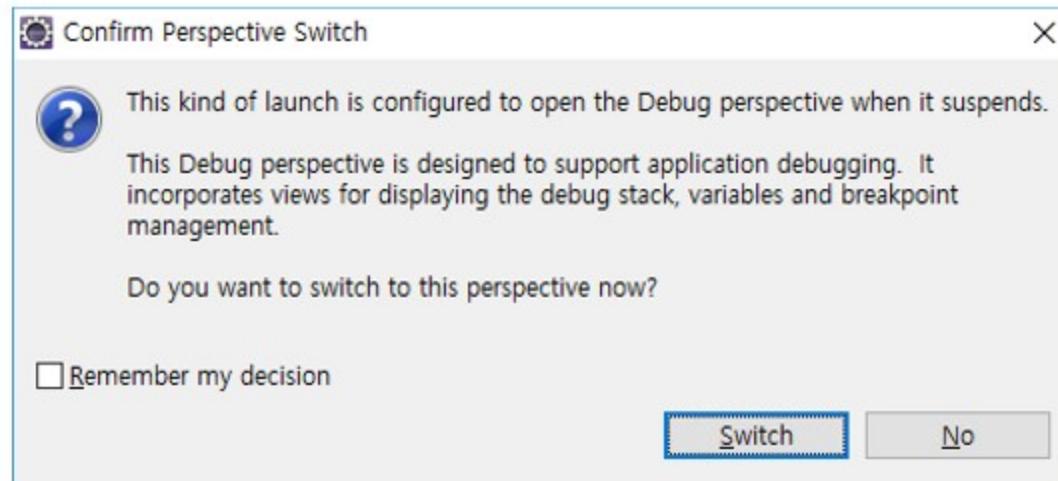
First Application

- Right click of package kr.ac.sejong.dbp.helloworld → New → Class
- Run MyHelloWorld
 - Right click for MyHelloWorld.java → Run As → Java Application



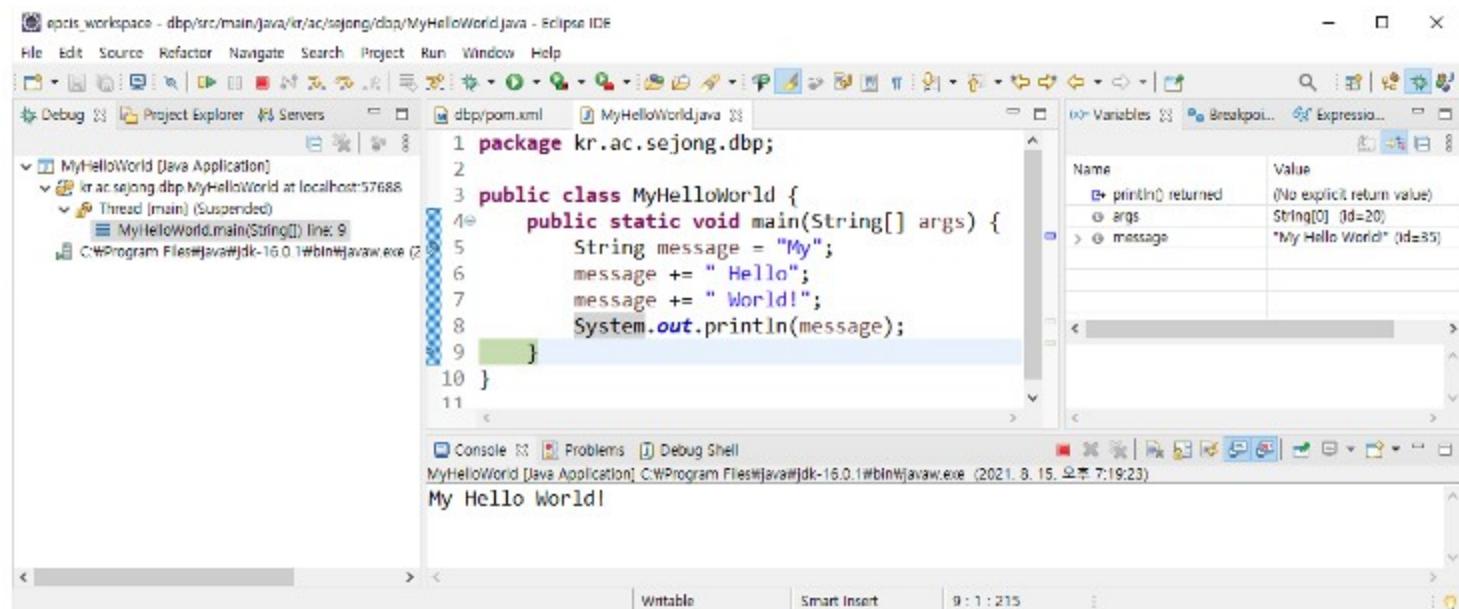
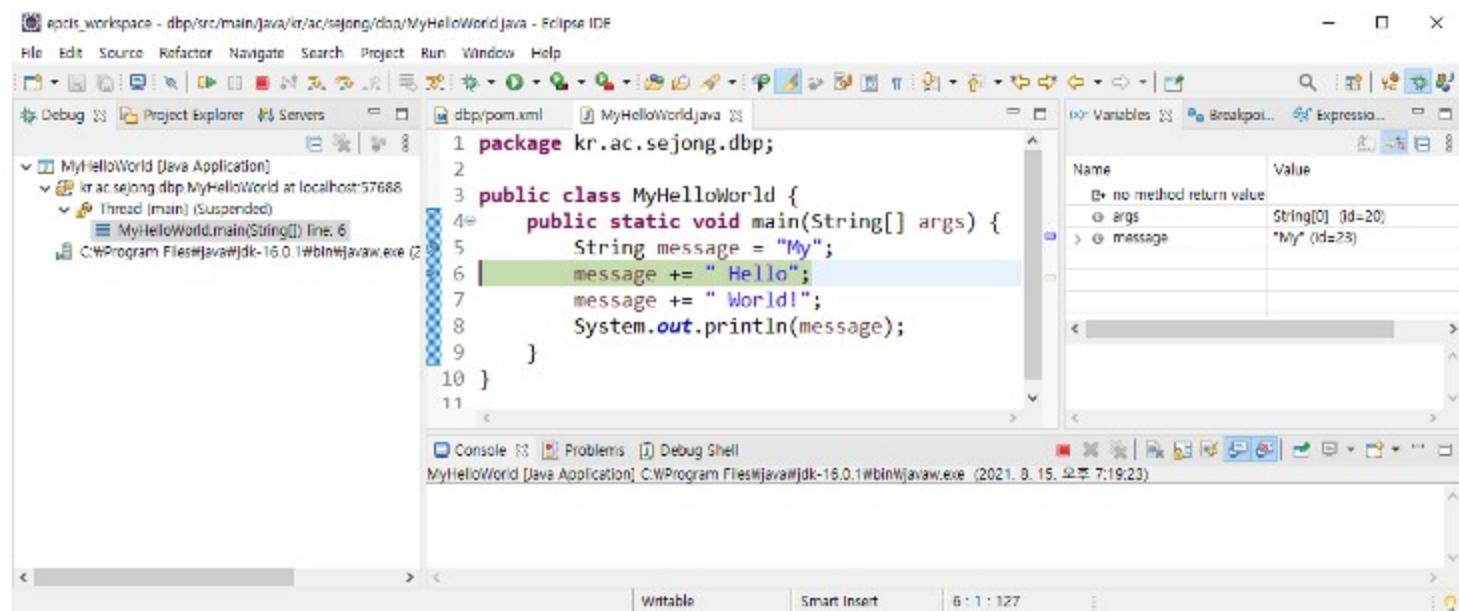
First Application

- Debug My Hello World
 - Double click at Line 7 (i.e., message += “Hello”);
- Right click for MyHelloWorld → Debug As → Java Application



First Application

- Step Over (F6)
- Step In (F5)
- Step into println method!



Second Application

- We can use external library such as org.json.json
- Originally
 - You need to download json.jar file
 - Add it to your build path
- With Maven
 - Search google “maven json”
 - Copy dependency and add it to pom.xml

Maven Gradle Gradle (Short) Gradle (Kotlin) SBT Ivy Grape Leiningen Buildr

```
<!-- https://mvnrepository.com/artifact/org.json/json -->
<dependency>
    <groupId>org.json</groupId>
    <artifactId>json</artifactId>
    <version>20210307</version>
</dependency>
```

json maven

All Images Videos News Maps More Tools

About 19,300,000 results (0.54 seconds)

<https://mvnrepository.com/artifact/org.json/json> ▾
org.json » json - Maven Repository
JSON is a light-weight, language independent, data interchange format. See
<http://www.JSON.org/> The files in this package implement JSON encoders/decoders ...
You've visited this page many times. Last visit: 3/2/21

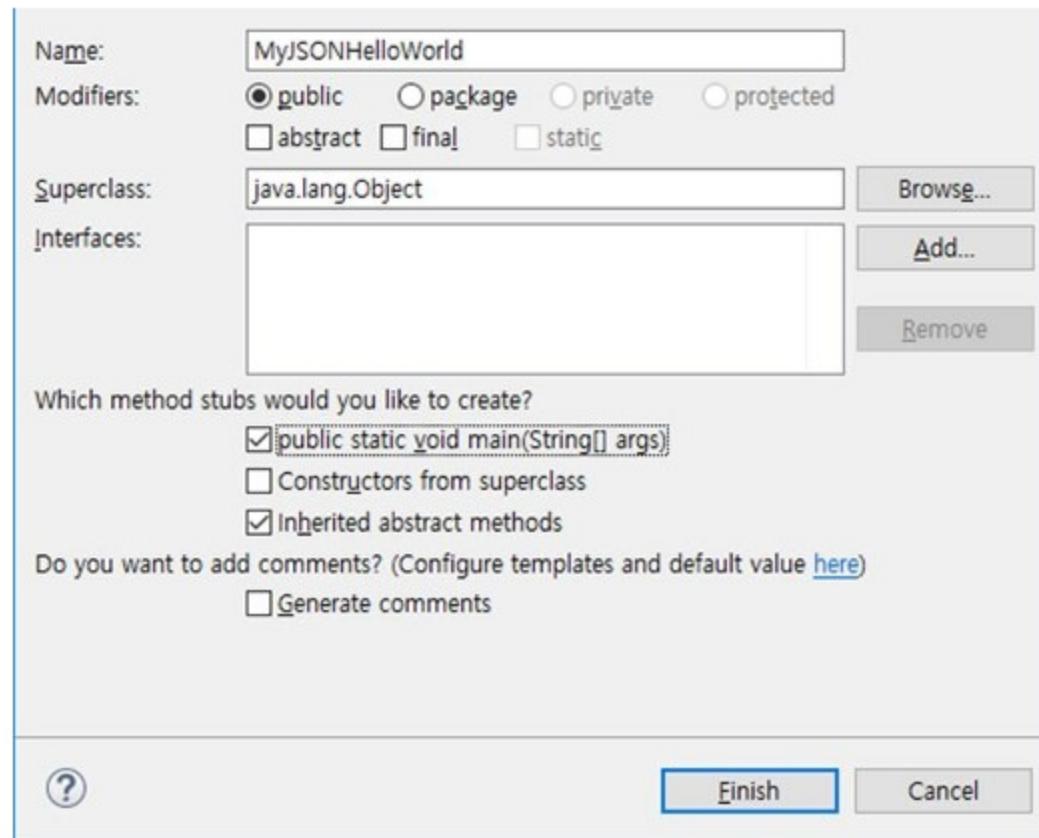
[JSON In Java » 20201115](#) [20210307](#)
JSON is a light-weight, language independent, data interchange ... JSON In Java » 20210307 ...
JSON is a light-weight, language ...

[More results from mvnrepository.com »](#)

```
<dependencies>
    <dependency>
        <groupId>junit</groupId>
        <artifactId>junit</artifactId>
        <version>4.11</version>
        <scope>test</scope>
    </dependency>
    <dependency>
        <groupId>org.json</groupId>
        <artifactId>json</artifactId>
        <version>20210307</version>
    </dependency>
</dependencies>
```

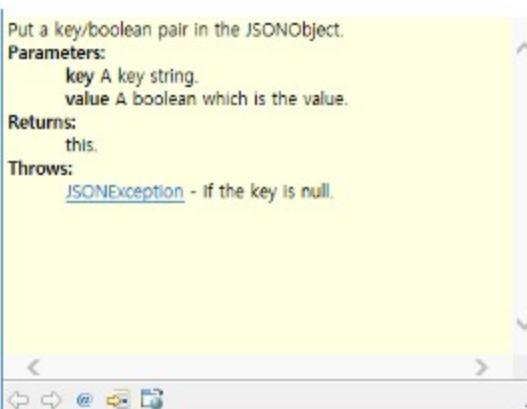
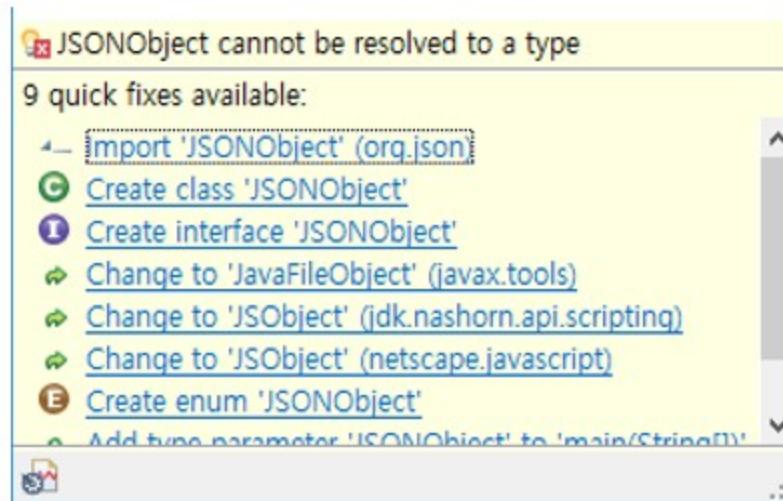
Second Application

- Update dependency
 - Maven → Update Project
 - Run → Maven Clean
 - Run → Maven Install
 - Will install org.json.json!
- Create MyJSONHelloWorld
- with public static void main



Second Application

- It is not a JSON course
- Just past the following code snippet into main method
 - `JSONObject jsonHello = new JSONObject();`
 - `jsonHello.put("message", "My JSON Hello World!");`
 - `System.out.println(jsonHello);`
- You will see error because `JSONObject` is not imported
- Resolve the error with IDE
 - Hover over `JSONObject`
 - Click import '`JSONObject`' as shown in →
- Maven → Download Javadoc
 - You can read their documentation
- Maven → Download Sources
 - You can step into 3rd party libraries



Second Application

- It is not a JSON course
- Just past the following code snippet into main method
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 - Click import 'JSONObject' as shown in
- Maven → Download Javadoc
 - You can read their documentation
- Maven → Download Sources
 - You can step into 3rd party libraries

The diagram illustrates the process of resolving an import error. On the right, a screenshot of an IDE shows a tooltip for the `JSONObject` type, listing various quick fixes. One of these fixes, 'Import 'JSONObject' (org.json)', is highlighted with a blue arrow originating from the 'Parameters' section of the JavaDoc tooltip on the left.

IDE Screenshot (Top Right):

JSONObject cannot be resolved to a type
9 quick fixes available:

- Import 'JSONObject' (org.json)
- Create class 'JSONObject'
- Create interface 'JSONObject'
- Change to 'JavaFileObject' (javax.tools)
- Change to 'JSONObject' (jdk.nashorn.api.scripting)
- Change to 'JSONObject' (netscape.javascript)
- Create enum 'JSONObject'
- Add type parameter 'JSONObject' to 'main/Stringify'

JavaDoc Tooltip (Bottom Left):

Put a key/boolean pair in the JSONObject.
Parameters:
key A key string.
value A boolean which is the value.
Returns:
this.
Throws:
[JSONException](#) - If the key is null.

Java Source Code (Bottom Right):

```
/**  
 * Put a key/value pair in the JSONObject. If the value is <code>null</code>  
 * key will be removed from the JSONObject if it is present.  
 *  
 * @param key  
 *          A key string.  
 * @param value  
 *          An object which is the value. It should be of one of the  
 *          types: Boolean, Double, Integer, JSONArray, JSONObject,  
 *          String, or the JSONObject.NULL object.  
 * @return this.  
 * @throws JSONException  
 *          If the value is non-finite number.  
 * @throws NullPointerException  
 *          If the key is <code>null</code>.  
 */  
public JSONObject put(String key, Object value) throws JSONException {  
    if (key == null) {  
        throw new NullPointerException("Null key.");  
    }  
    if (value != null) {  
        testValidity(value);  
        this.map.put(key, value);  
    } else {  
        this.remove(key);  
    }  
    return this;  
}
```

Preparation

- Install IntelliJ IDE
 - Download **latest** IntelliJ IDEA EDU
 - <https://www.jetbrains.com/ko-kr/idea/download/#section=windows>
 - Windows 64-bit

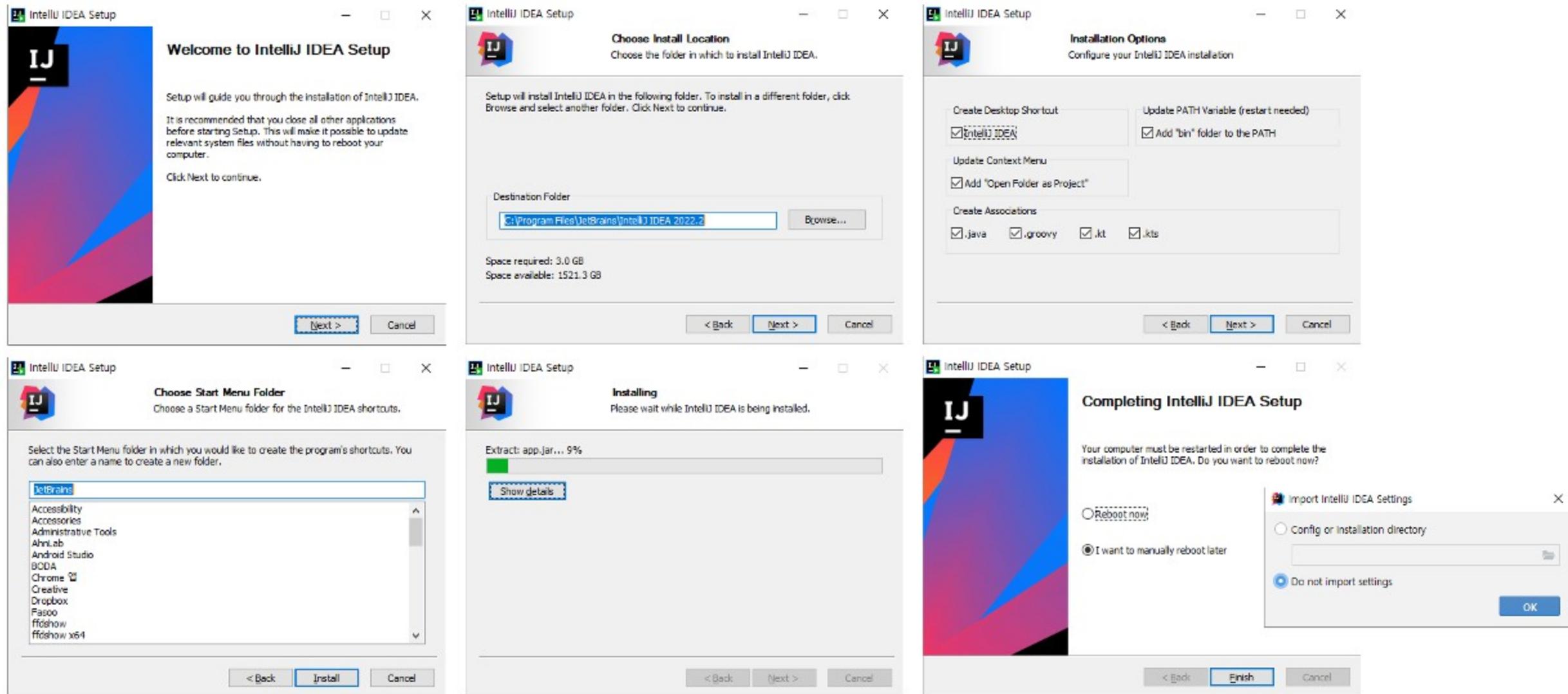
다운로드 IntelliJ IDEA

The screenshot shows the download page for IntelliJ IDEA. At the top, there are tabs for Windows, macOS, and Linux, with Windows selected. Below the tabs are two download options: 'Ultimate' and 'Community'. The 'Ultimate' section is highlighted with a red box and contains the text '웹 및 엔터프라이즈 개발용' and a download button labeled '다운로드 .exe'. Below this, it says '30일 무료 평가 이용 가능'. The 'Community' section contains the text 'JVM 및 Android 개발용' and a download button labeled '다운로드 .exe'. Below this, it says '무료, 오픈 소스로 빌드됨'. At the bottom, there is a table comparing features between IntelliJ IDEA Ultimate and IntelliJ IDEA Community Edition.

	IntelliJ IDEA Ultimate	IntelliJ IDEA Community Edition
Java, Kotlin, Groovy, Scala	✓	✓
Maven, Gradle, sbt	✓	✓
Git, GitHub, SVN, Mercurial, Perforce	✓	✓
디버거	✓	✓
Docker	✓	✓

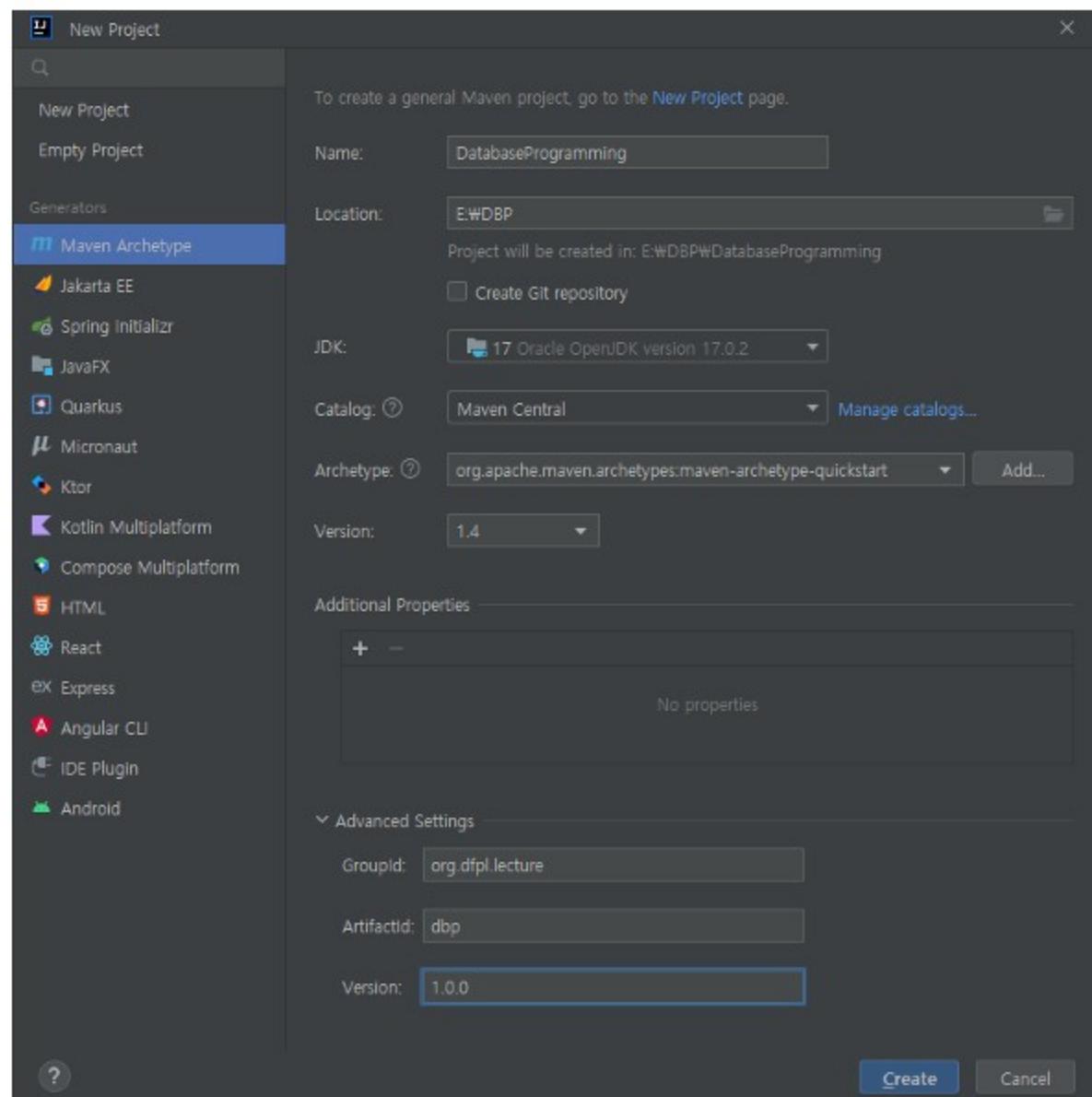
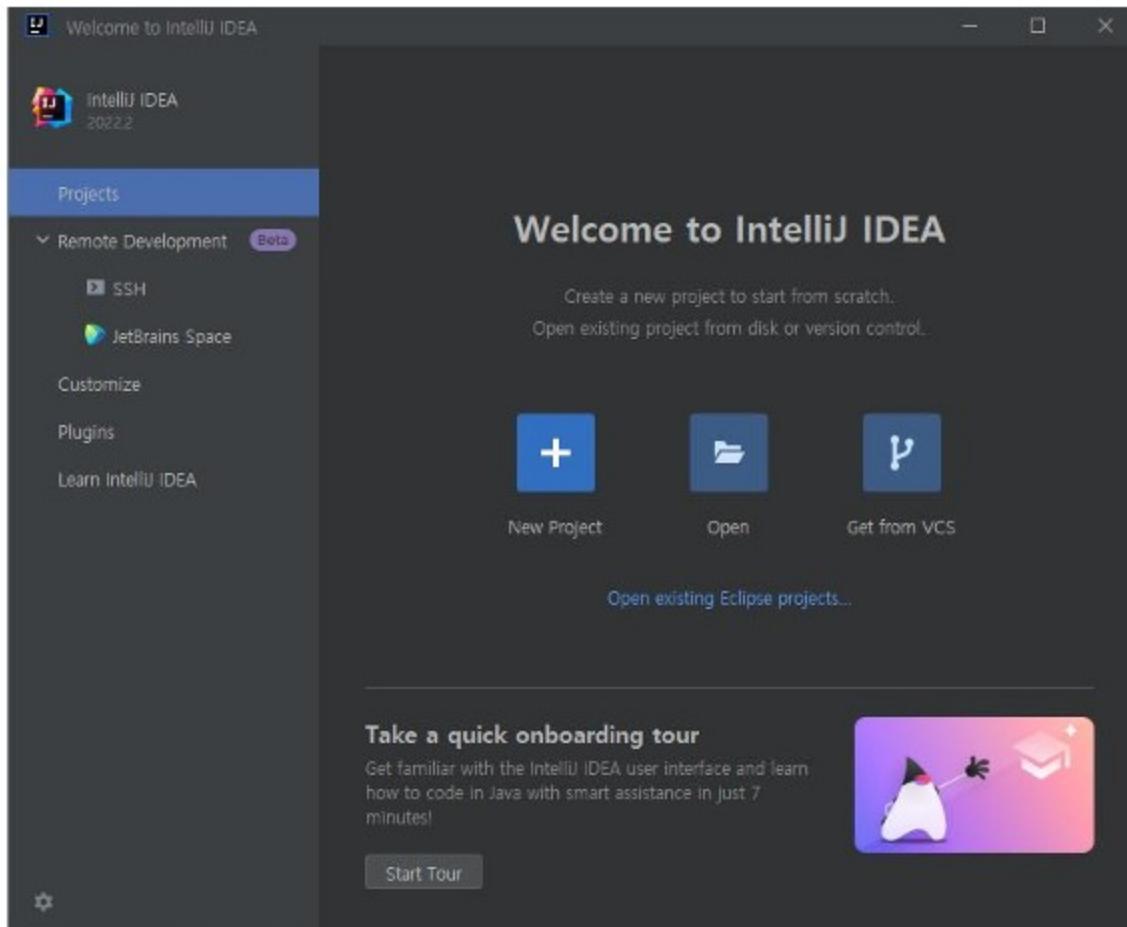
Preparation

- Install IntelliJ IDE



Preparation

- First project



First Application

- pom.xml file in Maven project
 - Feel
 - <properties>
 - <project.build.sourceEncoding>UTF-8</project.build.sourceEncoding>
 - <maven.compiler.source>17</maven.compiler.source>
 - <maven.compiler.target>17</maven.compiler.target>
 - </properties>
 - try **ctrl + alt + L** and see the magic

A screenshot of an IDE showing a code completion dropdown. The code being typed is:

```
public class App {  
    public static void main(String[] args) {  
        do  
    }
```

The dropdown shows the following suggestions:

- c System java.lang
- p args String[] ");
- m main(String[] args) void
- c App org.dfppl.lecture
- m clone() Object
- m equals(Object obj) boolean
- m hashCode() int
- m toString() String
- assert
- boolean
- else

At the bottom of the dropdown, it says "Press Enter to insert, Tab to replace".

First Application

- Run your first IntelliJ application
 - Right click at App
 - Run 'App.main()'

The screenshot shows the IntelliJ IDEA interface with the following details:

- Project Structure:** The left sidebar shows a project named "DatabaseProgramming" with modules ".idea", "src", "main", "java", and "org.dfpl.lecture".
- Run Configuration Dialog:** A context menu is open over the "main" module, with the "Run 'App.main()'" option highlighted.
- Code Editor:** The main editor window displays the following Java code:

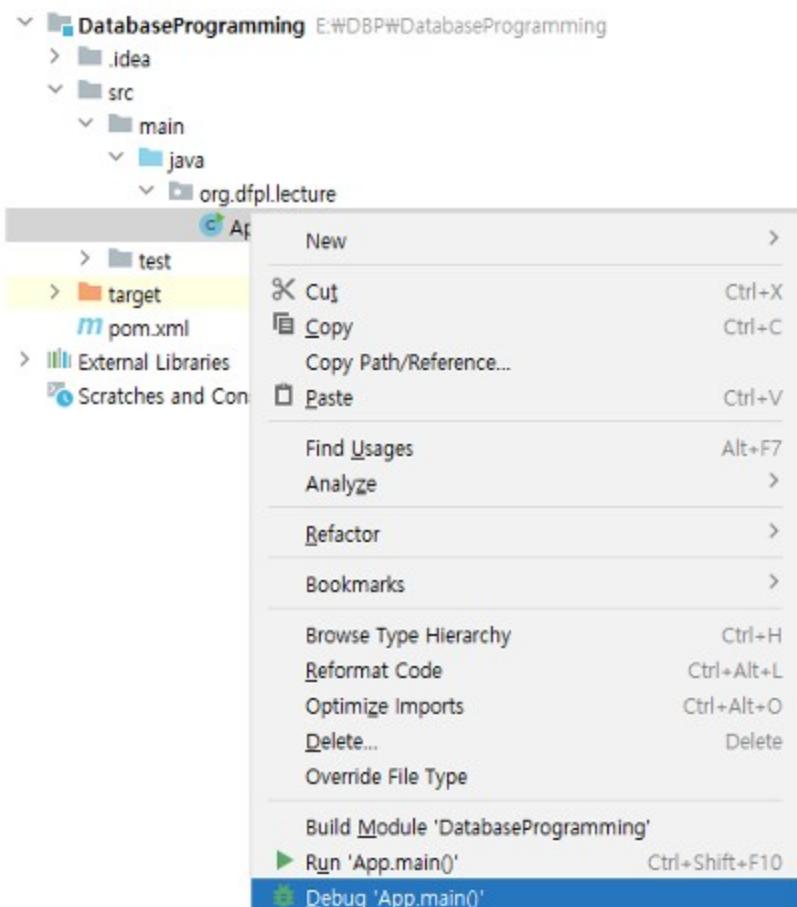
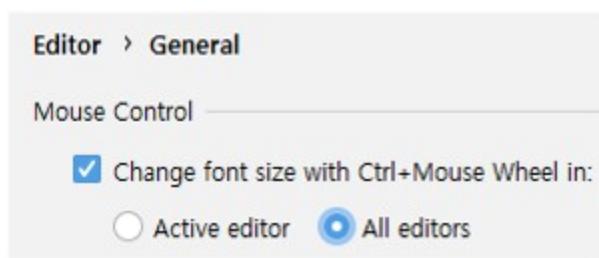
```
1 package org.dfpl.lecture;
2
3 /**
4 * Hello world!
5 */
6 public class App {
7
8     public static void main(String[] args) {
9         System.out.println("Hello World!");
10    }
11 }
```
- Output Window:** On the right, the "App" run configuration shows the output:

```
"C:\Program F:
Hello World!
Process finis"
```
- Run Control Bar:** At the bottom right, there are "Run Control" and "Run" buttons.

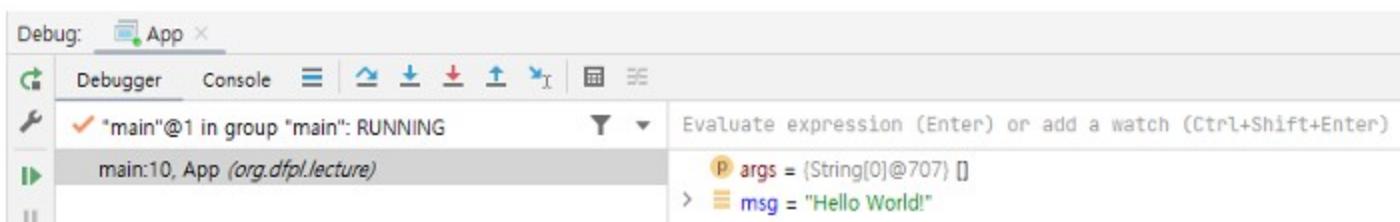
First Application

- Debug your application
 - click at Line 8

```
6 public class App {  
7     public static void main(String[] args) {  
8         String msg = "Hello ";  
9         msg += "World!";  
10        System.out.println(msg);  
11    }  
12 }
```



- Right click at App → Debug 'App.main()'
 - F8: Step over
 - F7: Step into
 - Alt + F9: Run to cursor



Second Application

- Feel extensibility
- We can use external library such as org.json.json
- Originally
 - You need to download json.jar file
 - Add it to your build path
- With Maven
 - Search google “maven json”
 - Copy dependency and add it to pom.xml

```
Maven Gradle Gradle (Short) Gradle (Kotlin) SBT Ivy Grape Leiningen Buildr

<!-- https://mvnrepository.com/artifact/org.json/json -->
<dependency>
    <groupId>org.json</groupId>
    <artifactId>json</artifactId>
    <version>20220320</version>
</dependency>
```

maven json

검색결과 약 21,700,000개 (0.42초)

<https://mvnrepository.com> › artifact › org.json › json

org.json - Maven Repository

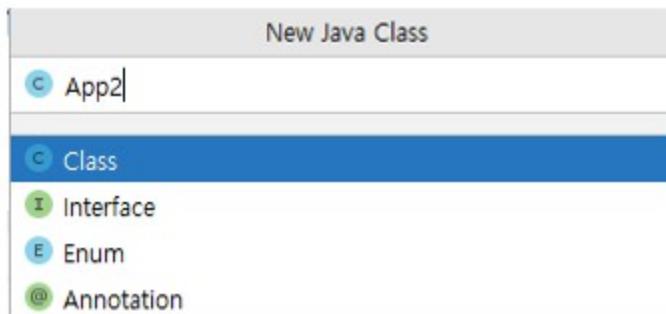
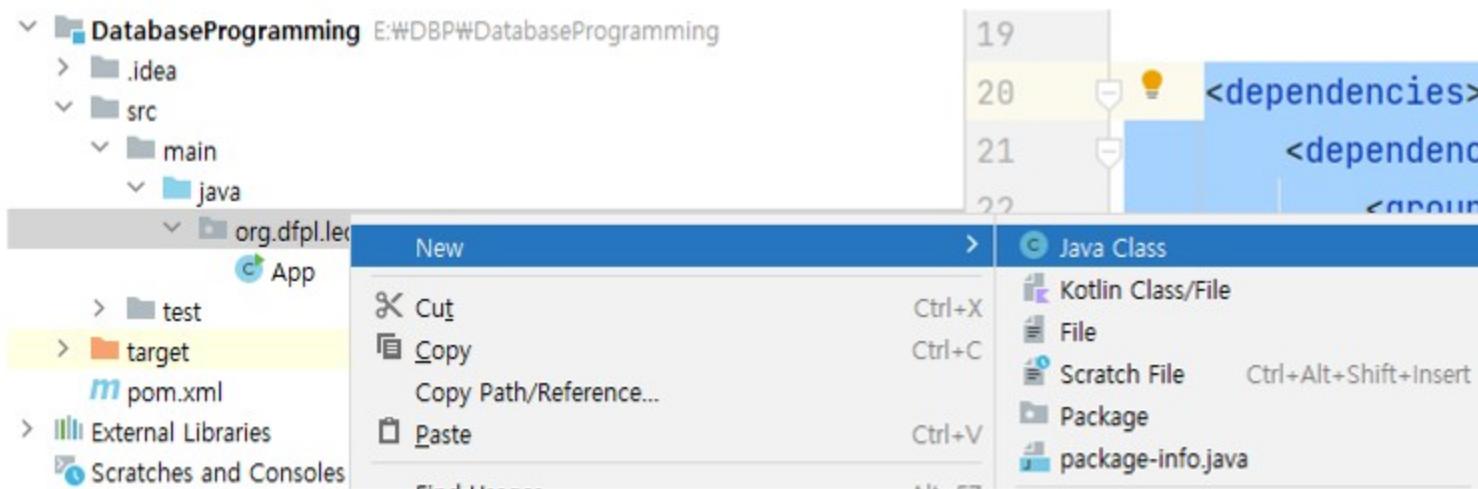
Version	Repository	Usages	Date
20220320	Central	212	Mar 20, 2022
20211205	Central	173	Dec 05, 2021
20210307	Central	317	Mar 09, 2021

18행 더보기

```
<dependencies>
    <dependency>
        <groupId>junit</groupId>
        <artifactId>junit</artifactId>
        <version>4.13.2</version>
        <scope>test</scope>
    </dependency>
    <dependency>
        <groupId>org.json</groupId>
        <artifactId>json</artifactId>
        <version>20220320</version>
    </dependency>
</dependencies>
```

Second Application

- Create one more Java file for the second application
 - Click right at the package
 - New → Java Class



Second Application

- Create one more Java file for the second application
 - Create static main method

```
public class App2 {  
    main  
} main           main() method declaration  
Ctrl+Down and Ctrl+Up will move caret down and up in the editor Next Tip  
```

```
public class App2 {  
    public static void main(String[] args) {  
        JSONObject obj = new JSONObject();  
        obj.put("name", "Prof. Jaewook Byun");  
        obj.put("class", "Database Programming");  
  
        System.out.println(obj);  
    }  
}
```

CONSOLE

```
{"name":"Prof. Jaewook Byun","class":"Database Programming"}
```

Summary

- Preparation for Java Review
 - Open JDK 19
 - Eclipse IDE
 - Maven
 - Run and Debug first application
 - Run and Debug second application using 3rd party library