

# Assignment #2

# SQL Programming

CSE42101: Introduction to Database Systems

Fall 2021

Computer Science and Engineering

Sang Hyeon Eum and Ilwoo Lyu

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# Scenario

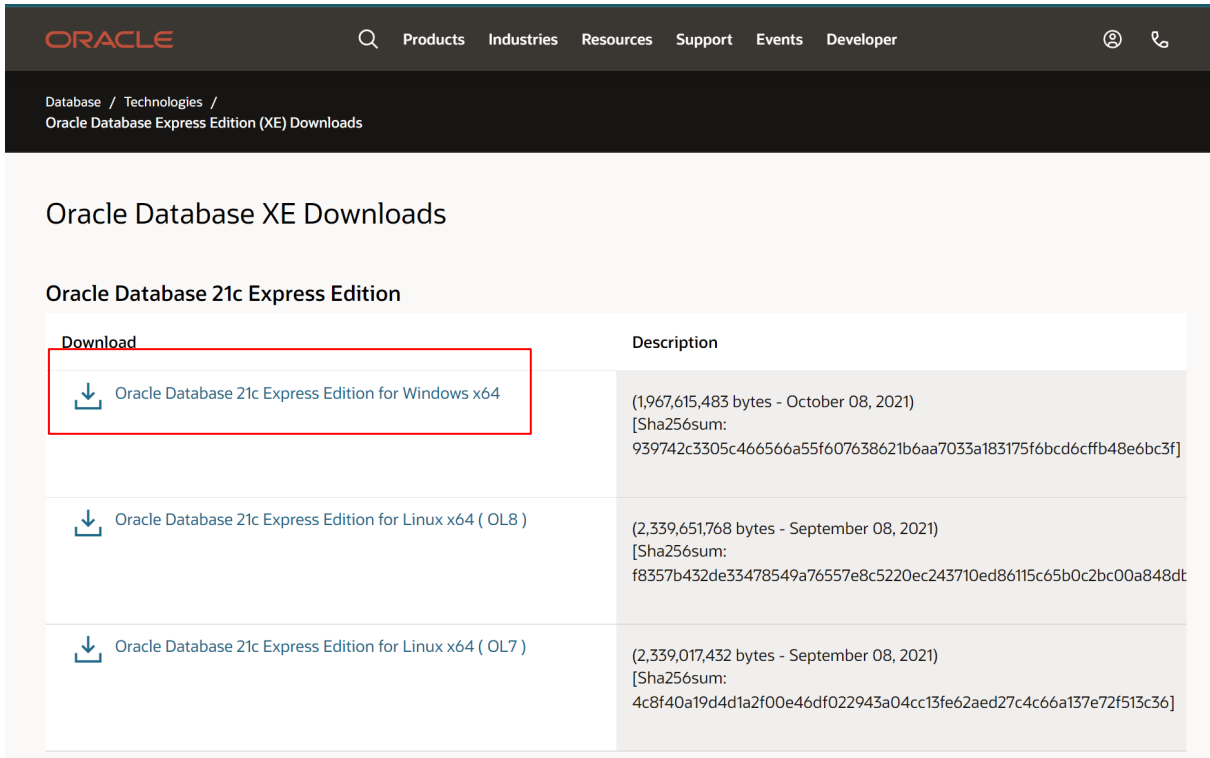
- 'bagaji.com' is a portal for price comparisons of electronic devices
- The site provides two product categories: computer and TV
- Only two companies make products
- Unfortunately, they maintain different schemas
- You decide to integrate these schemas as a global (virtual) table

# Approaches

- You will do
  1. Combine two schemas for price comparisons without creating a new table.
  2. Implement some functionalities for price comparisons (e.g., product search, product recommendation, etc.).
  3. Employ Oracle Database Express Edition for your DBMS and python for creating UI and communicating with your DBMS




# Oracle Database 21g Express Edition

- Download 21g Express Edition



Oracle Database XE Downloads

Oracle Database 21c Express Edition

Download	Description
 Oracle Database 21c Express Edition for Windows x64	(1,967,615,483 bytes - October 08, 2021) [Sha256sum: 939742c3305c466566a55f607638621b6aa7033a183175f6bcd6cffb48e6bc3f]
 Oracle Database 21c Express Edition for Linux x64 ( OL8 )	(2,339,651,768 bytes - September 08, 2021) [Sha256sum: f8357b432de33478549a76557e8c5220ec243710ed86115c65b0c2bc00a848dt]
 Oracle Database 21c Express Edition for Linux x64 ( OL7 )	(2,339,017,432 bytes - September 08, 2021) [Sha256sum: 4c8f40a19d4d1a2f00e46df022943a04cc13fe62aed27c4c66a137e72f513c36]

Please visit for download database at

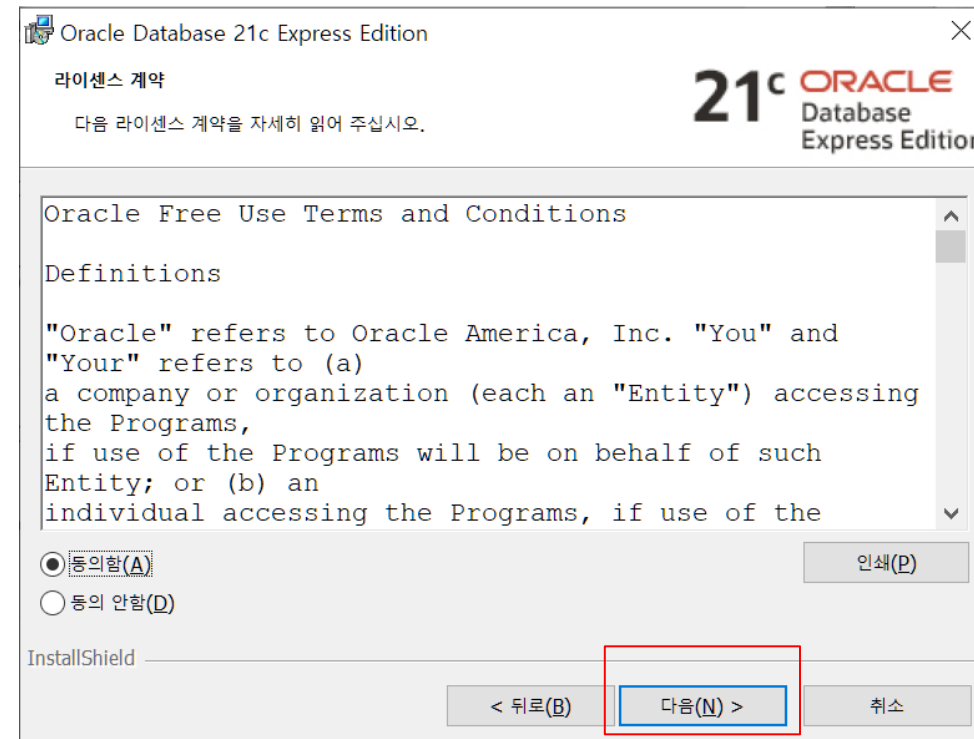
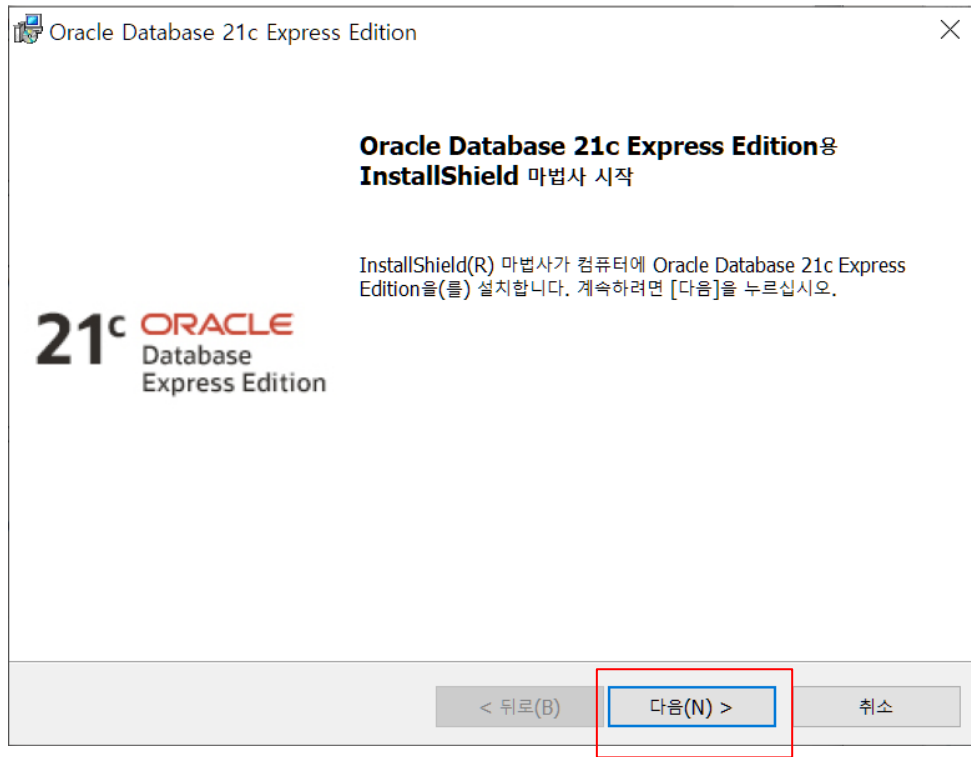
<https://www.oracle.com/database/technologies/xedownloads.html>

1. Download OracleXE213\_Win64.zip
2. Unzip OracleXE213\_Win64.zip
3. Launch setup.exe

# Oracle Database 21g Express Edition

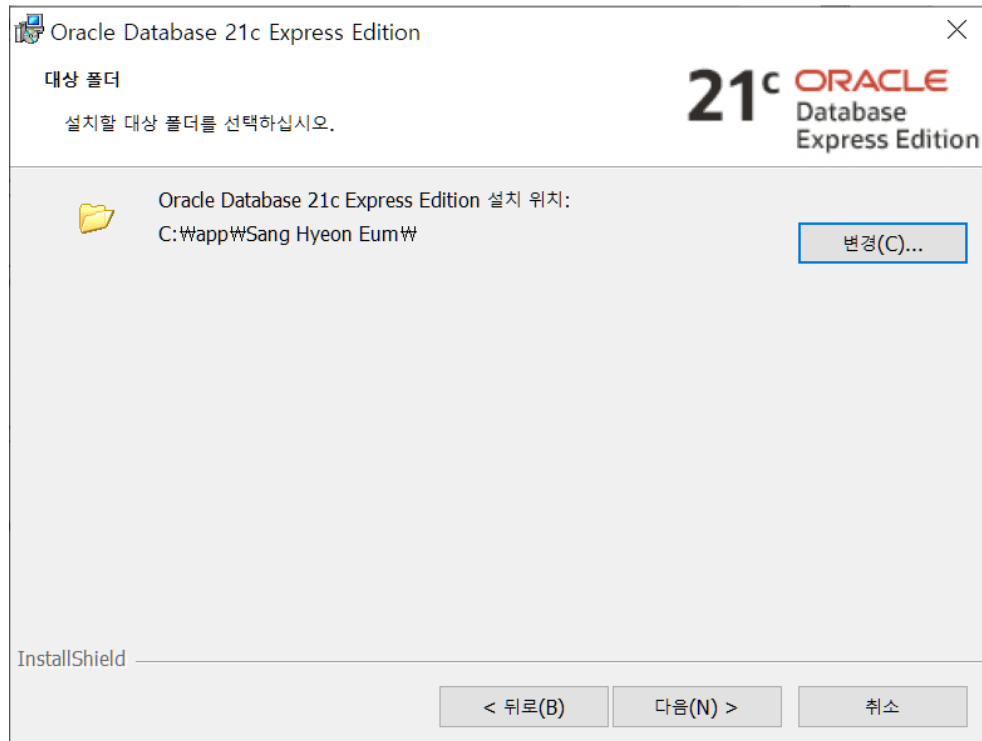
- Download 21g Express Edition

## 4. Install 21g Express Edition

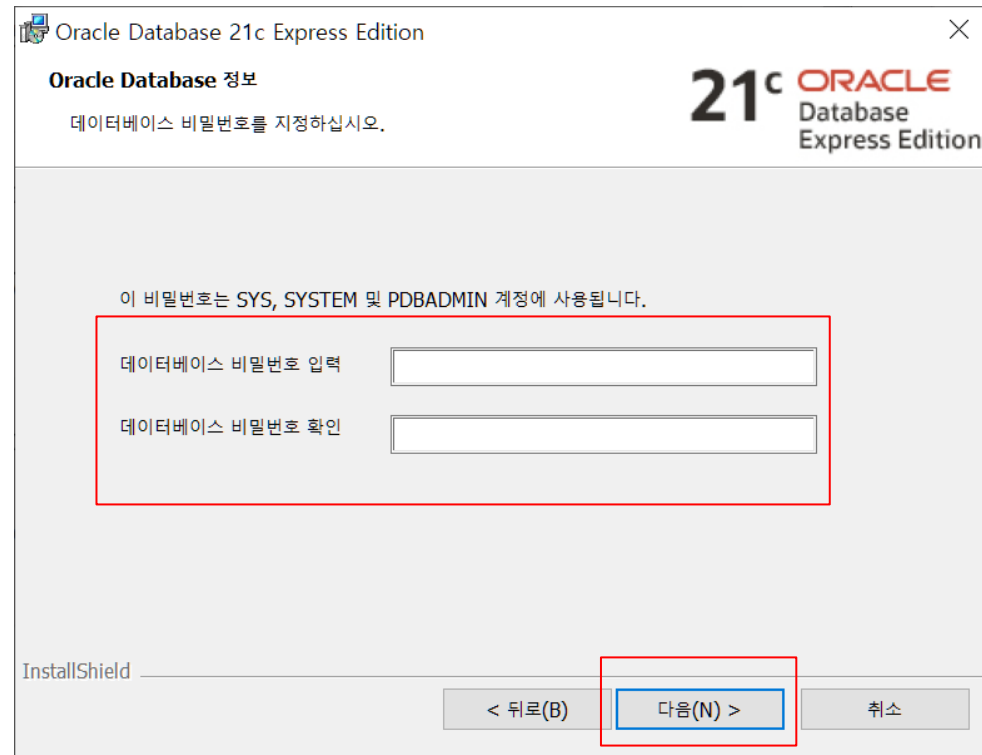


# Oracle Database 21g Express Edition

- Download 21g Express Edition



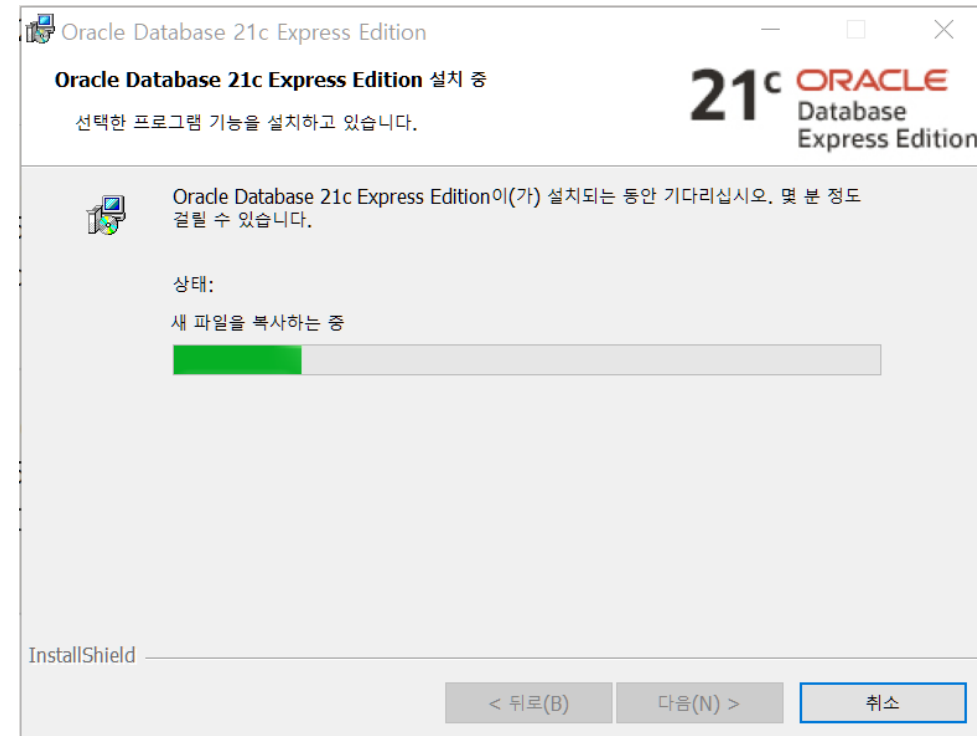
## 5. Setup installation DIR and password



# Oracle Database 21g Express Edition

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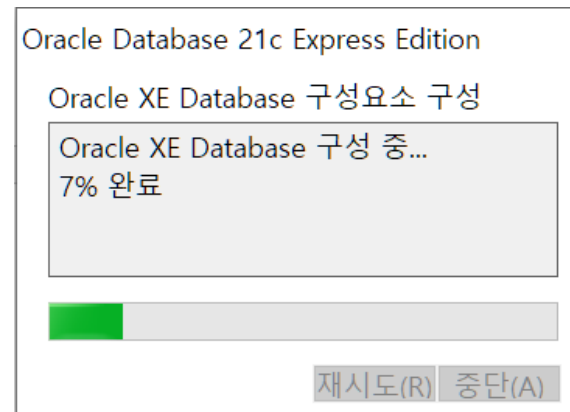
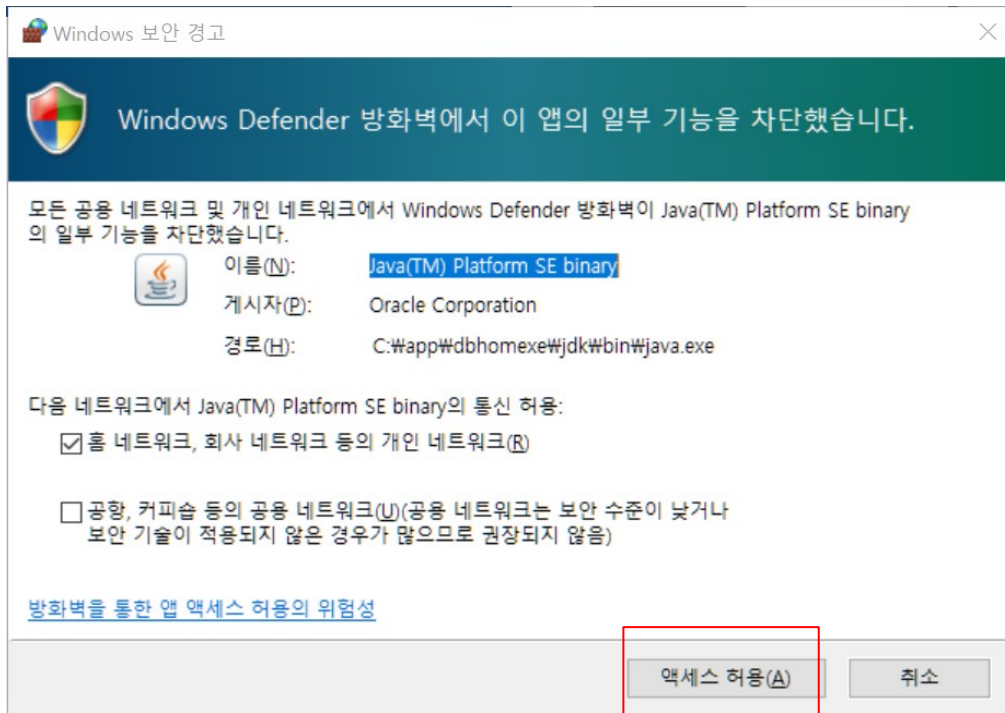
## 5. Click install



# Oracle Database 21g Express Edition

- Setting 21g Express Edition

6. Wait for install, it takes a few minutes

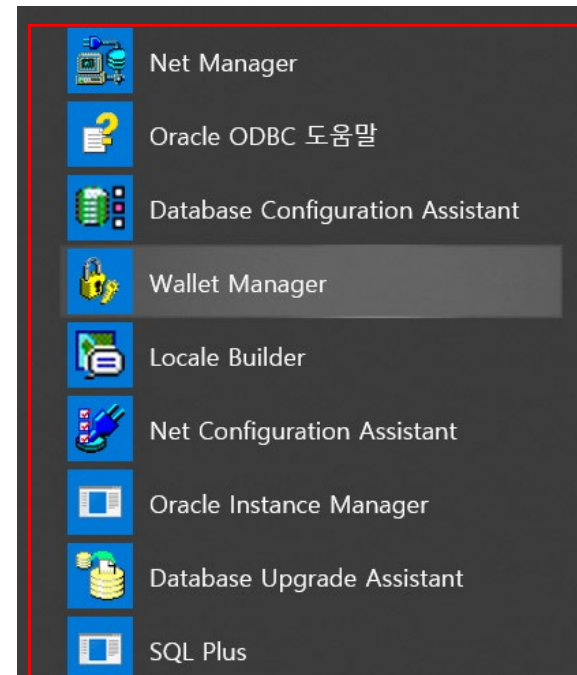
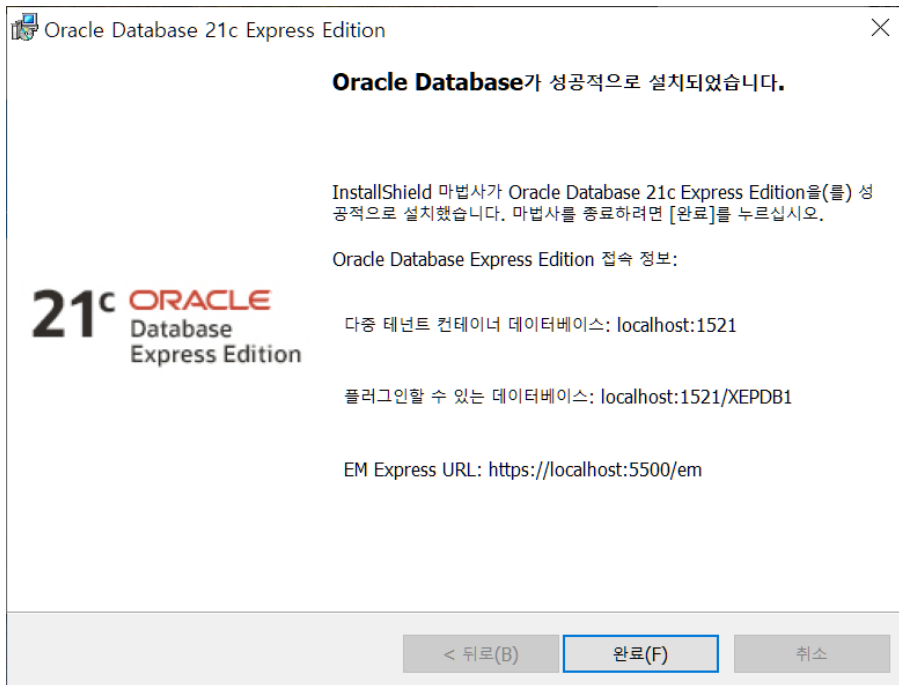




# Oracle Database 21g Express Edition

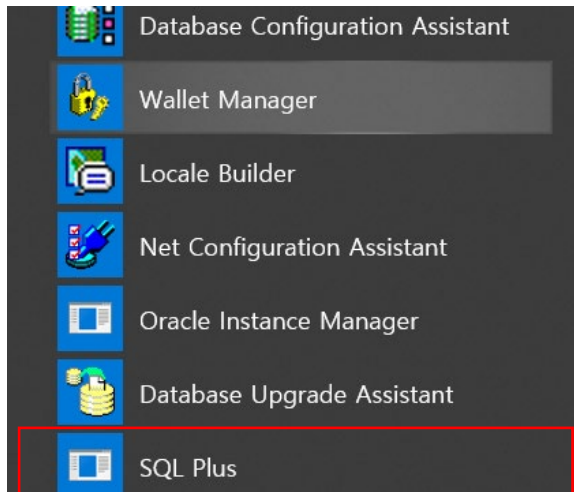
- Download 21g Express Edition

## 7. Configure install



# Oracle Database 21g Express Edition

- Download 21g Express Edition



7. launch SQLplus

Username : SYSTEM

Password : **"YOUR PASSWD"**



# Oracle Database 21g Express Edition

- Download SQLdeveloper

ORACLE

Products Industries Resources Support Events Developer

Tools / Downloads / SQL Developer Downloads

## SQL Developer 21.2.1 Downloads

Version 21.2.1.204.1703 - August 11, 2021

- [Release Notes](#)
- [Bugs Fixed](#)
- [Documentation](#)

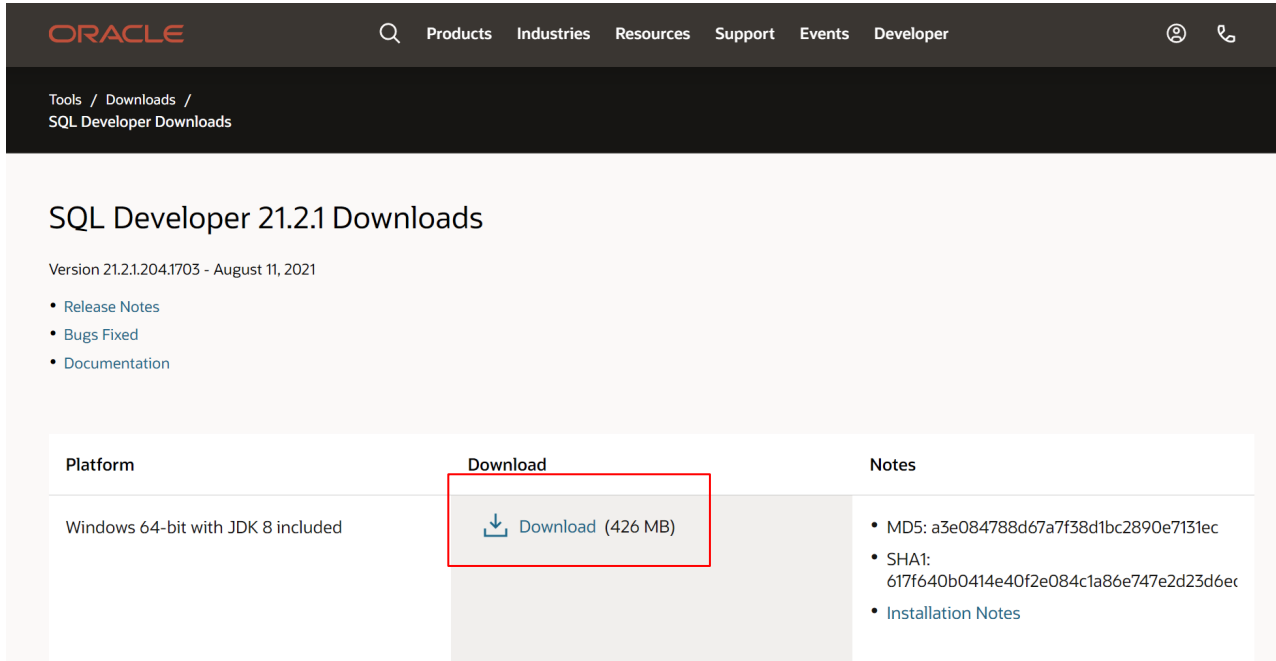
Platform	Download	Notes
Windows 64-bit with JDK 8 included	<a href="#">Download (426 MB)</a>	<ul style="list-style-type: none"><li>• MD5: a3e084788d67a7f38d1bc2890e7131ec</li><li>• SHA1: 617f640b0414e40f2e084c1a86e747e2d23d6ec</li><li>• <a href="#">Installation Notes</a></li></ul>

- 8. Download SQLdeveloper

<https://www.oracle.com/tools/downloads/sqldev-downloads.html>

# Oracle Database 21g Express Edition

- Download SQLdeveloper



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Tools / Downloads / SQL Developer Downloads

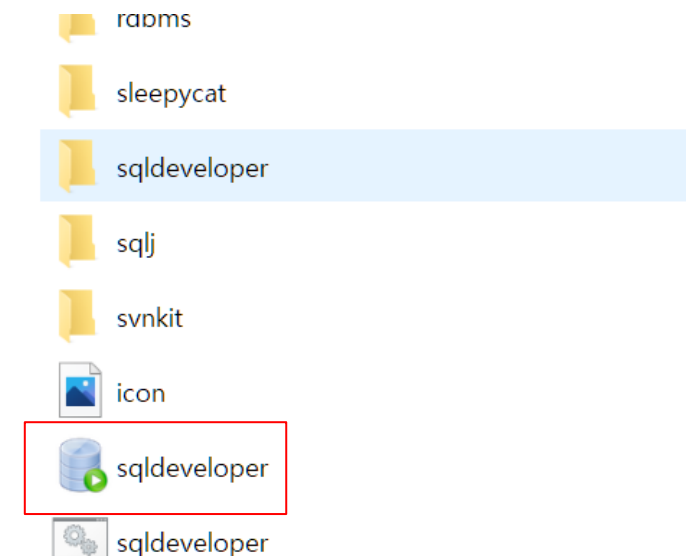
## SQL Developer 21.2.1 Downloads

Version 21.2.1.204.1703 - August 11, 2021

- [Release Notes](#)
- [Bugs Fixed](#)
- [Documentation](#)

Platform	Download	Notes
Windows 64-bit with JDK 8 included	<a href="#">Download (426 MB)</a>	<ul style="list-style-type: none"><li>• MD5: a3e084788d67a7f38d1bc2890e7131ec</li><li>• SHA1: 617f640b0414e40f2e084c1a86e747e2d23d6ec</li><li>• <a href="#">Installation Notes</a></li></ul>

9. unzip sqldeveloper-21.2.1.204.1703-x64.zip
10. launch sqldeveloper.exe



# Oracle Database 21g Express Edition

- Download SQLdeveloper

11. Click New connection



# Oracle Database 21g Express Edition

- Setting SQLdeveloper

새로 만들기/데이터베이스 접속 선택

접속 이름    접속 세부정보

Name:     Color

데이터베이스 유형: Oracle

사용자 정보    프록시 사용자

인증 유형: 기본값

사용자 이름(U):     비밀번호(P):     비밀번호 저장(Y): ☐

접속 유형(Y): 기본

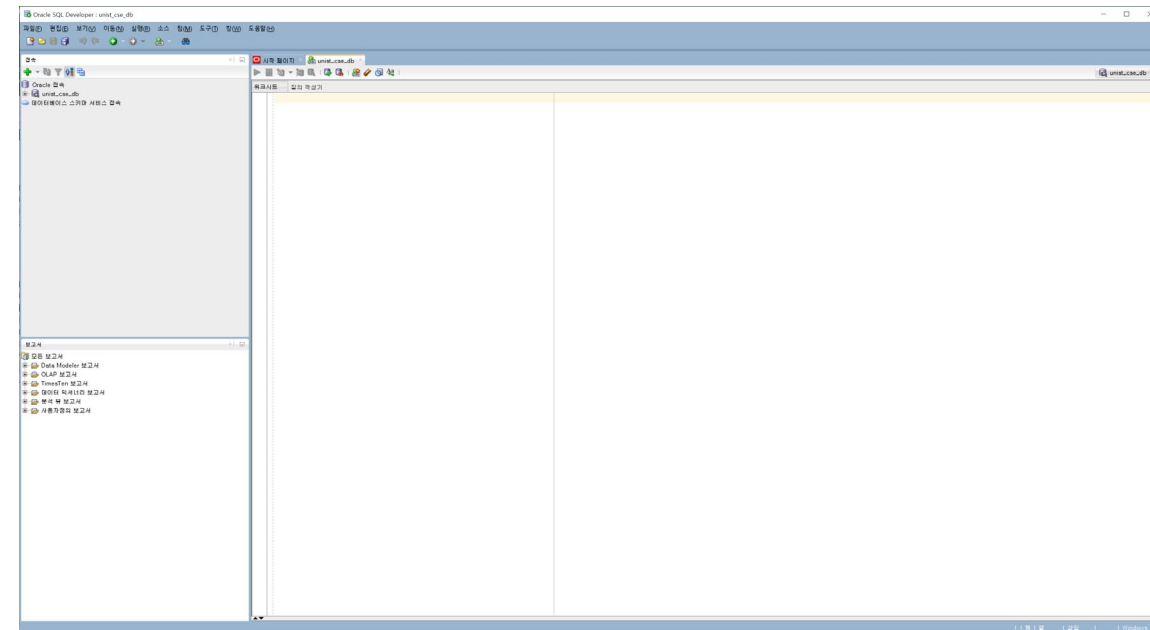
세부정보    고급

호스트 이름(A):     포트(R):     SID(I):     서비스 이름(S):

상태:

도움말(H)    저장(S)    지우기(C)    테스트(T)    **접속(O)**    취소

## 12. Enter configuration



# Oracle Database 21g Express Edition

- Setting SQLdeveloper (Enter in SQLplus, Create User)
  - Set Oracle\_Script : **alter session set "\_ORACLE\_SCRIPT"=true;**
  - Create user : **create user "USER\_NAME" identified by "USER\_PASSWD";**
  - Create login permission for the user : **grant create session to "USER\_NAME"**
  - General Authorization : **grant connect, resource to "USER\_NAME"**
  - Create table and grant table insert permission :  
**alter user "USER\_NAME" default tablespace users quota unlimited on users**

Please choose your name and password carefully.

# Oracle Database 21g Express Edition

- Setting SQLdeveloper

13. Enter configuration.

```
SQL> alter session set "_ORACLE_SCRIPT"=true;
```

```
SQL> create user unist identified by unist;
```

```
SQL> grant connect, resource to unist;
```

```
SQL> alter user unist default tablespace users quota unlimited on users;
```

```
SQL> alter user unist default tablespace users quota unlimited on users;
```



# Oracle Database 21g Express Edition

- Setting SQLdeveloper

## 14. New Connection with created account



# Oracle Database 21g Express Edition

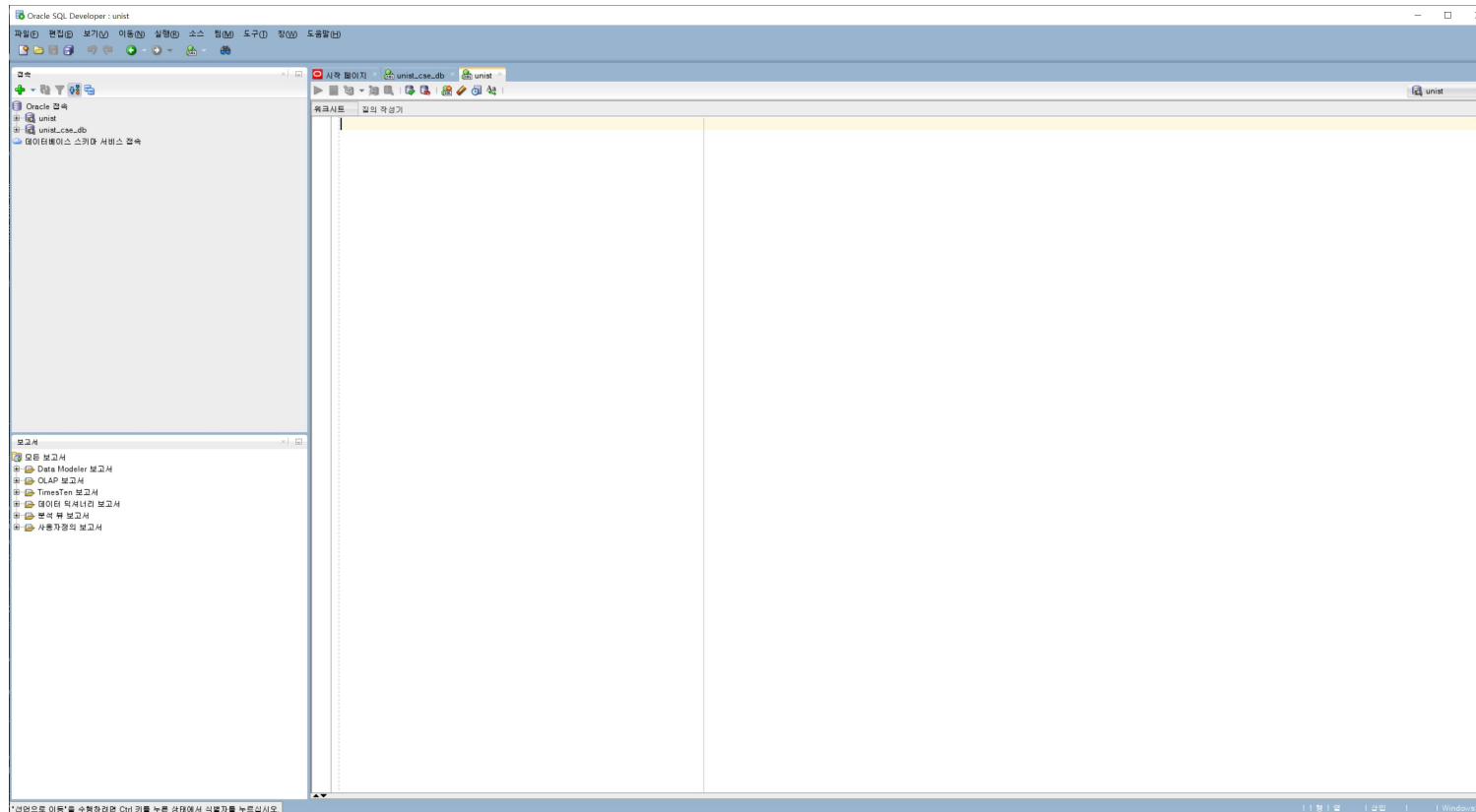
- Setting SQLdeveloper

14. New Connection with created account

The screenshot shows the 'New Connection' dialog box in SQL Developer. The dialog is titled '새로 만들기/데이터베이스 접속 선택'. It has two tabs: '접속 이름' (Connection Name) and '접속 세부정보' (Connection Details). The '접속 이름' tab is active, showing a list of connections with 'unist\_cse\_db' selected. The '접속 세부정보' tab is also visible, showing fields for 'Name' (unist), '데이터베이스 유형' (Oracle), '사용자 정보' (User Information), '인증 유형' (Basic), '사용자 이름' (unist), '비밀번호' (\*\*\*\*\*), '접속 유형' (Basic), '세부정보' (Advanced), '호스트 이름' (localhost), '포트' (1521), and 'SID' (xe). The '접속' (Connect) button is highlighted with a red box.

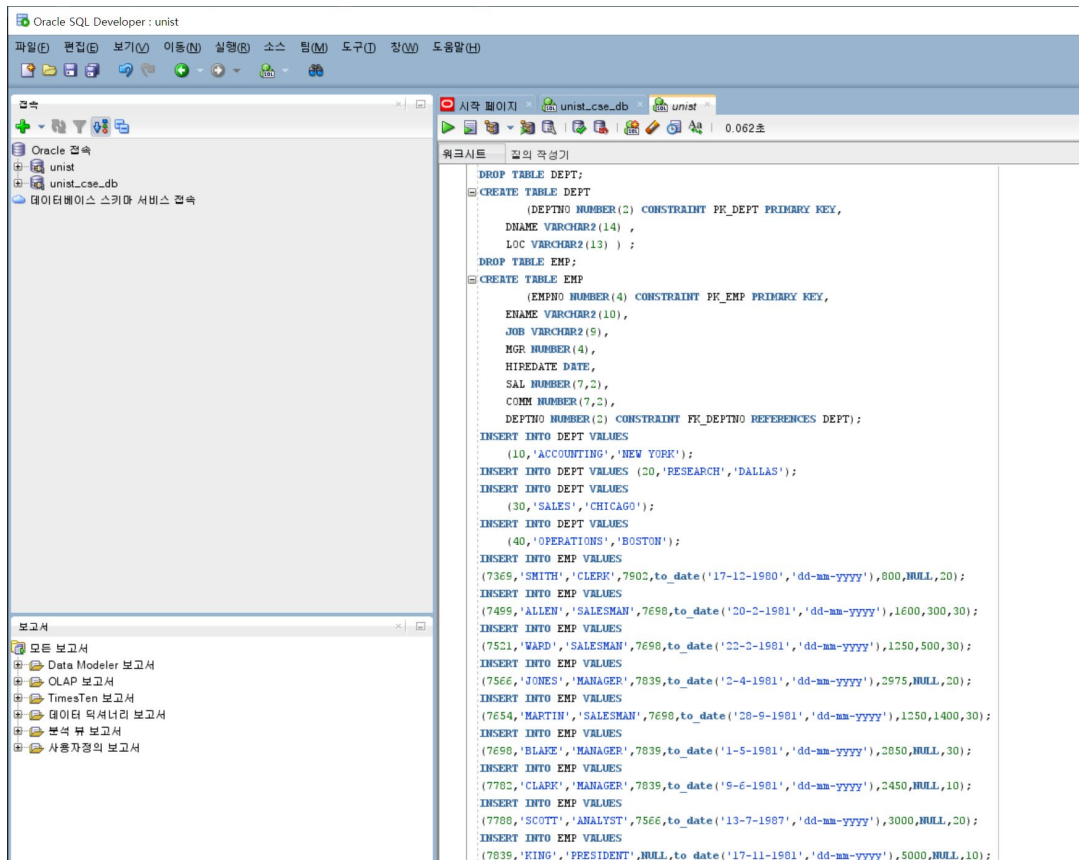
# Oracle Database 21g Express Edition

- Setting SQLdeveloper



# Oracle Database 21g Express Edition

## • SQL example



Open the class.sql file with notepad and select all.  
After copying it to the SQL editor window,  
execute the 'Run Script' (F5) command.

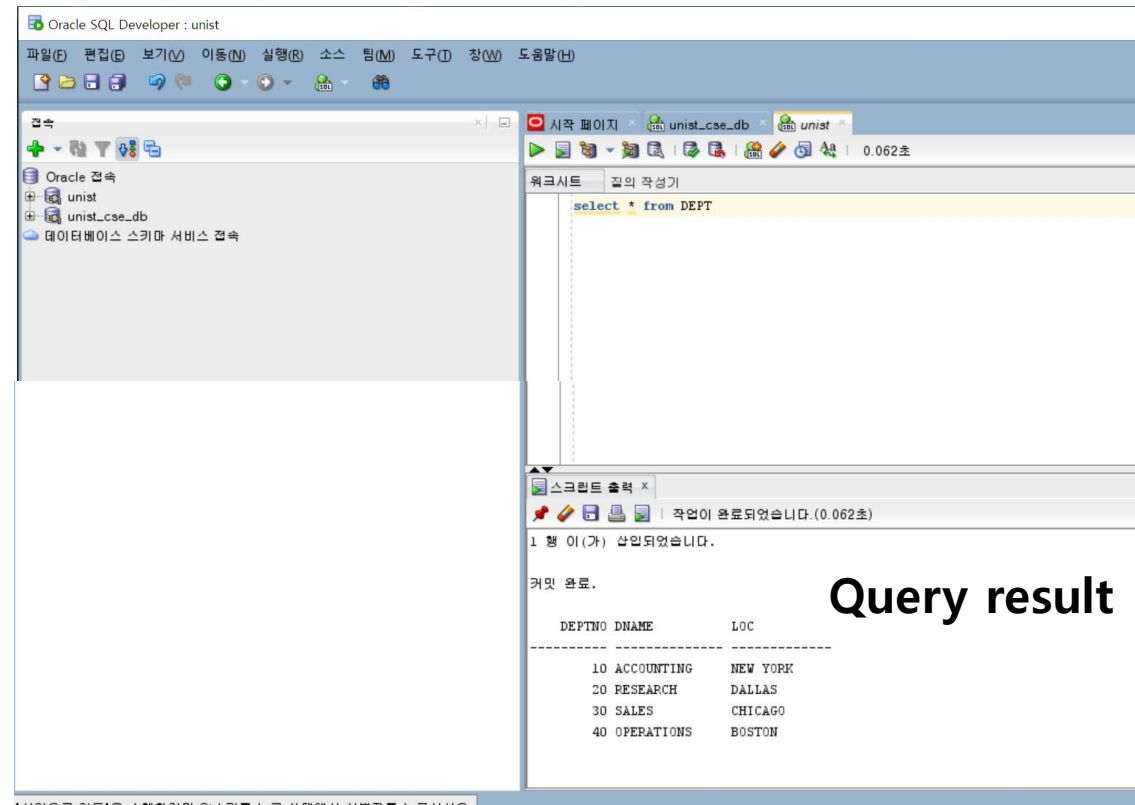


**Commit Complete!**

# Oracle Database 21g Express Edition

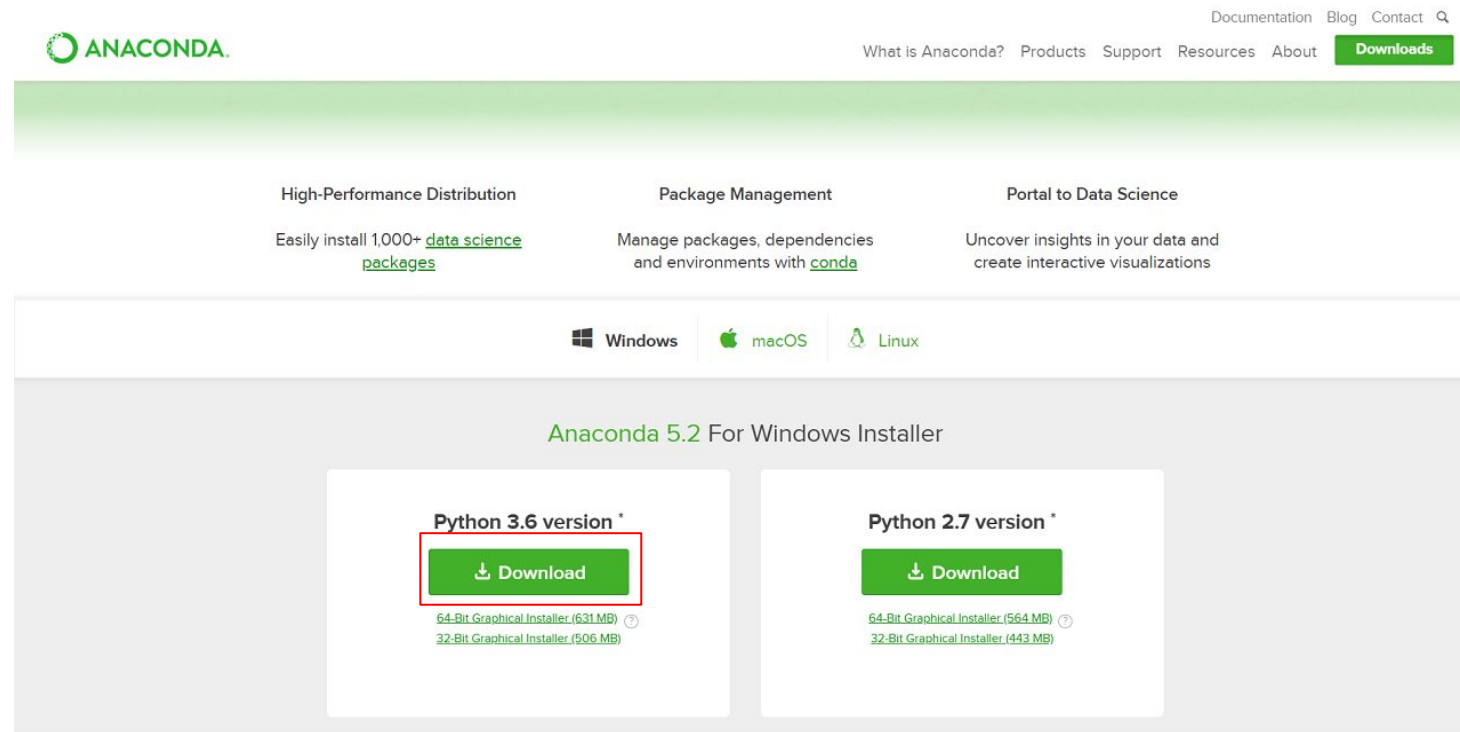
Enter "**select \* from DEPT**",  
execute the 'Run Script' (F5) command.

- SQL example



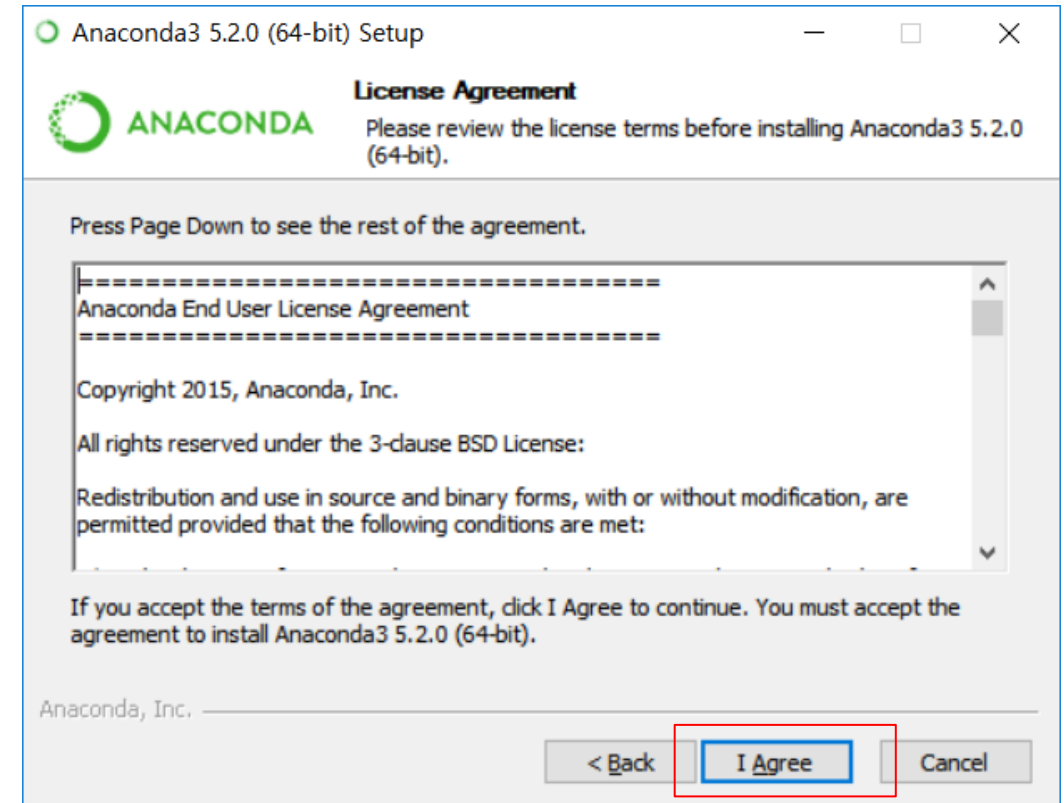
# Oracle system link with Python

- Anaconda3 (<https://www.anaconda.com/download/>)



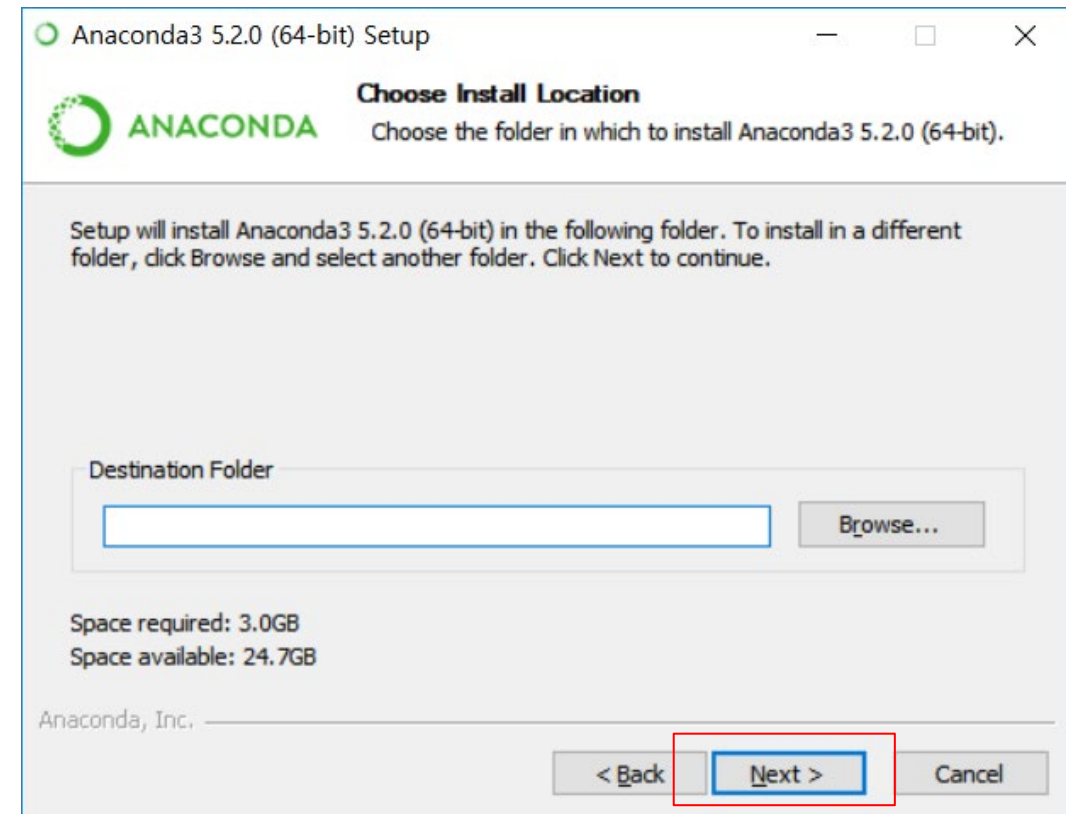
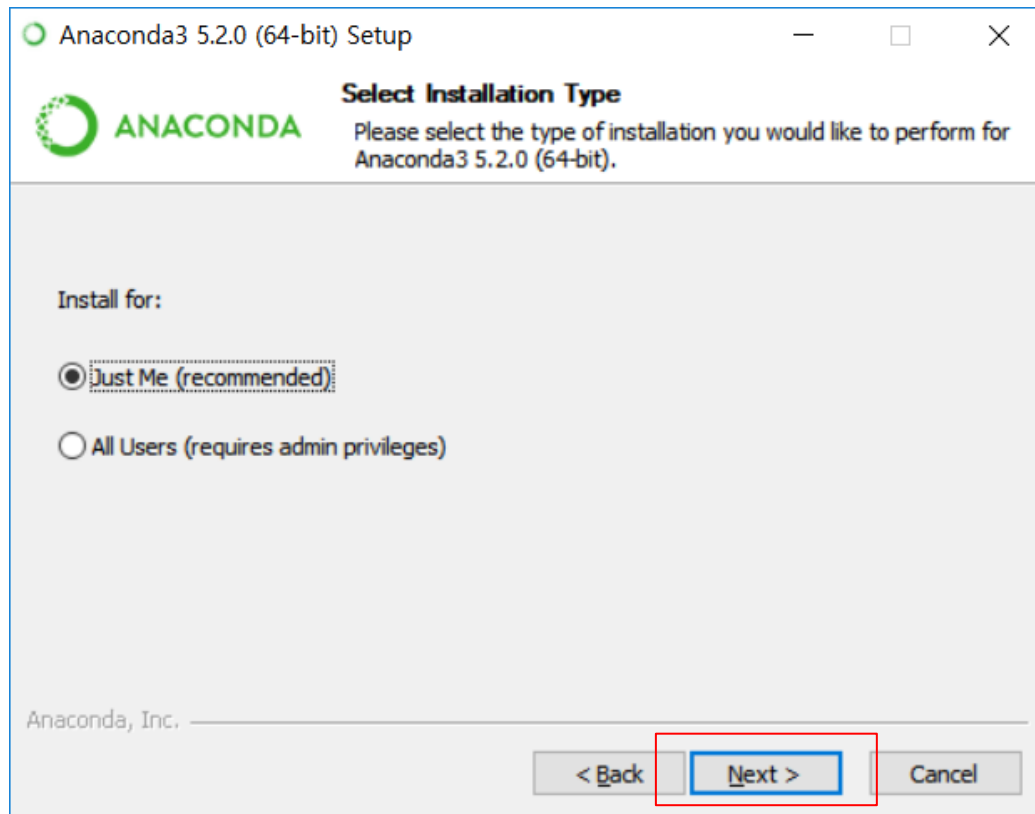
# Oracle system link with Python

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# Oracle system link with Python

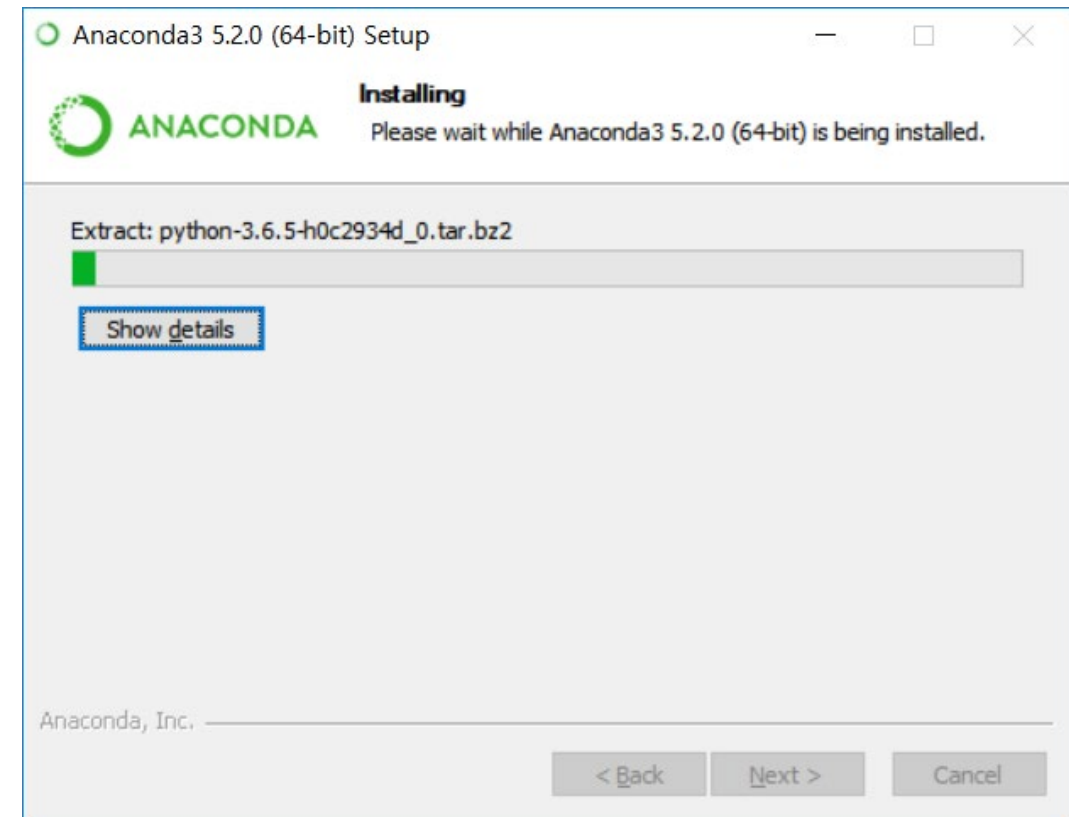
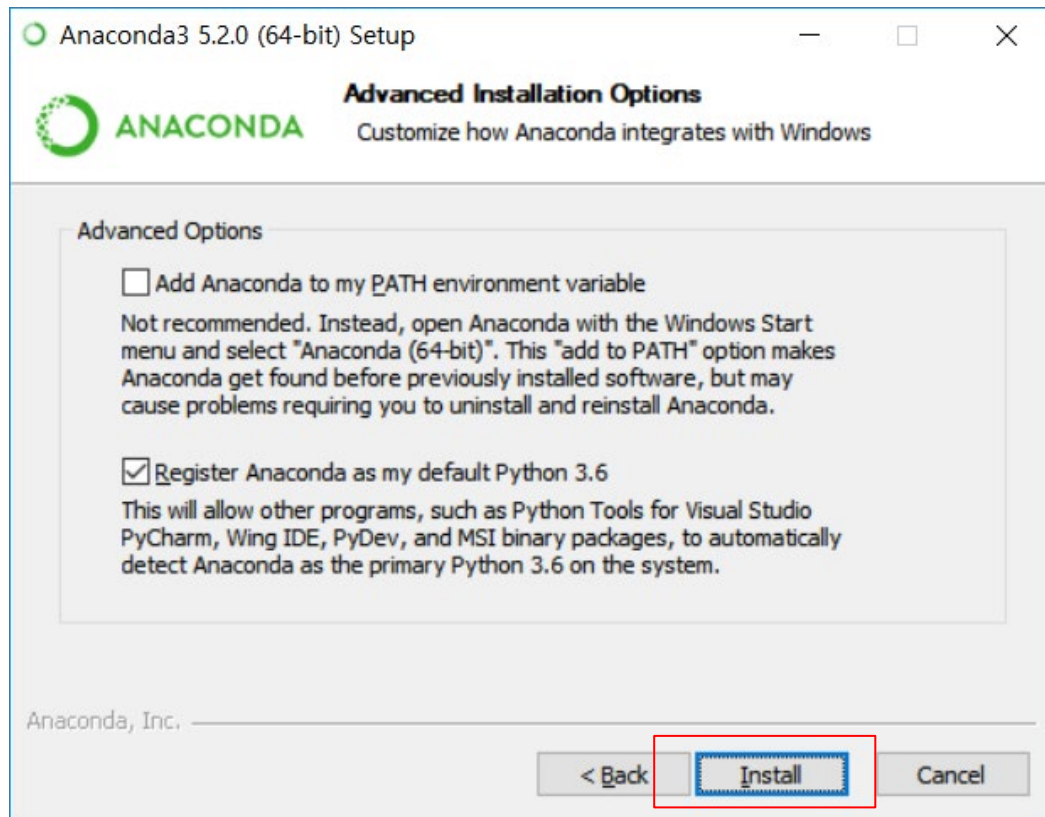
- Anaconda3 (<https://www.anaconda.com/download/>)





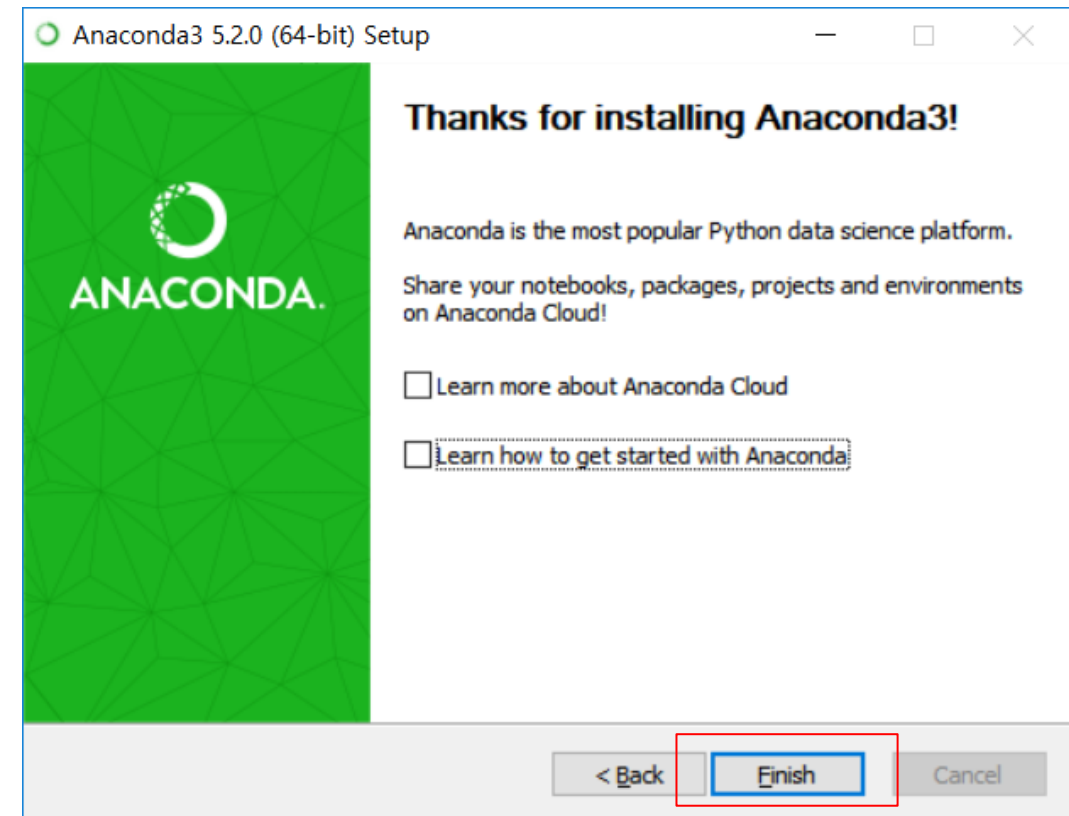
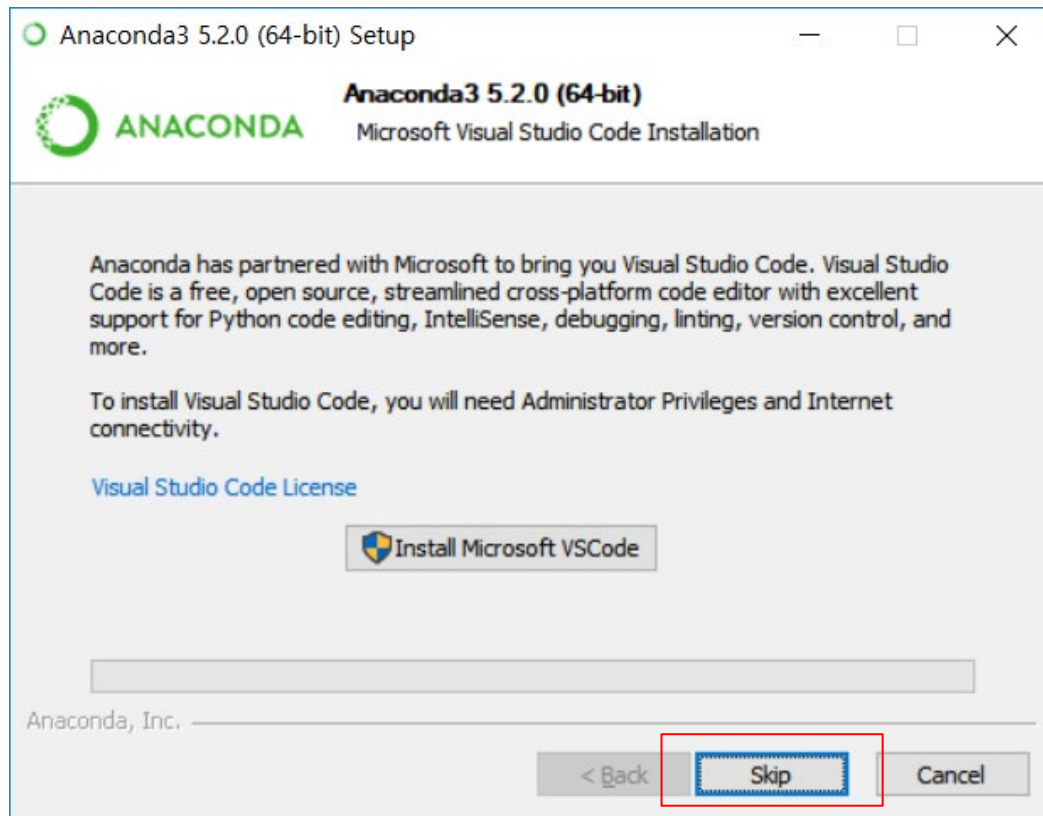
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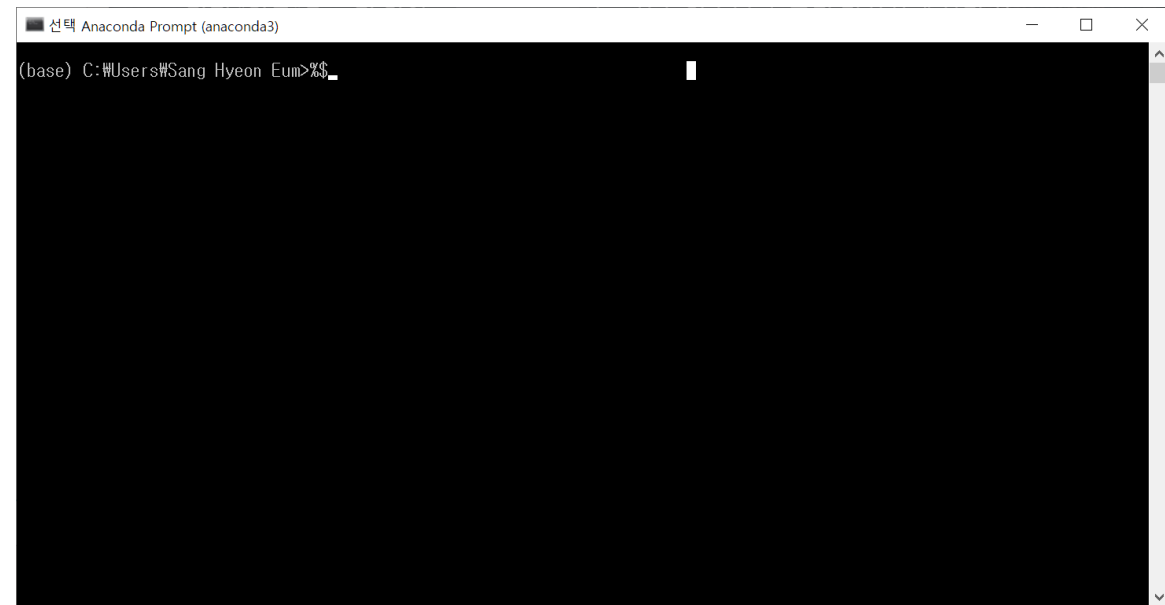
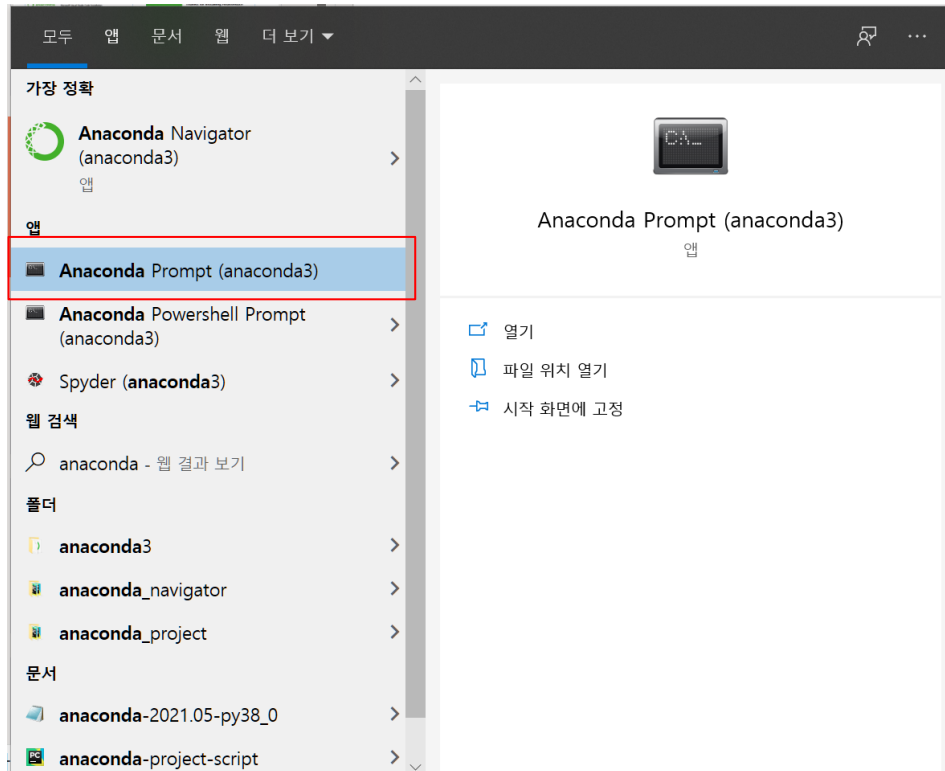
# Oracle system link with Python

- Anaconda3 (<https://www.anaconda.com/download/>)



# Oracle system link with Python

- Anaconda3 (<https://www.anaconda.com/download/>)



# Oracle system link with Python

- Anaconda3 virtual environment setting
  - Create virtual env  
:\$ **conda create -n "ENV\_NAME" python=3.6.5**
  - Activate virtual env  
:\$ **conda activate "ENV\_NAME"**
  - Install cx\_oracle  
:\$ **pip install cx\_oracle==8.2**

# Oracle system link with Python

- Oracle Instant Client Downloads

- <https://www.oracle.com/kr/database/technologies/instant-client/winx64-64-downloads.html>

## Oracle Instant Client Downloads for Microsoft Windows (x64) 64-bit

See the [Instant Client Home Page](#) for more information about Instant Client.


The [installation instructions](#) are at the foot of the page.

Oracle Client-to-Oracle Database version interoperability is detailed in [Doc ID 207303.1](#). For example, applications using Oracle Call Interface 19 can connect to Oracle Database 11.2 or later. Some tools may have other restrictions.

Permanent links to the latest packages are: [Basic](#), [Basic Light](#), [SQL\\*Plus](#), [Tools](#), [SDK](#), [JDBC Supplement](#), [ODBC](#)

### Version 21.3.0.0.0

**Base - one of these packages is required**

Name	Download	Description
Basic Package	 <a href="#">instantclient-basic-windows.x64-21.3.0.0.0.zip</a>	All files required to run OCI, OCCI, and JDBC:OCI applications (85,461,658 bytes) (cksum - 1666423509)

# Oracle system link with Python

- Oracle Instant Client Downloads

- Unzip

- ```
:$ unzip instantclient-basic-windows.x64-21.3.0.0.0.zip
```

- Set environment variable

- ```
:$ setx path "%PATH%;PATH_OF_instantclient_21_3"
```

# Oracle system link with Python

- Configure connection client (client.py)

```
import cx_Oracle

connection = cx_Oracle.connect(
    user="USER_NAME",
    password="USER_PASSWORD",
    dsn="localhost:1521")

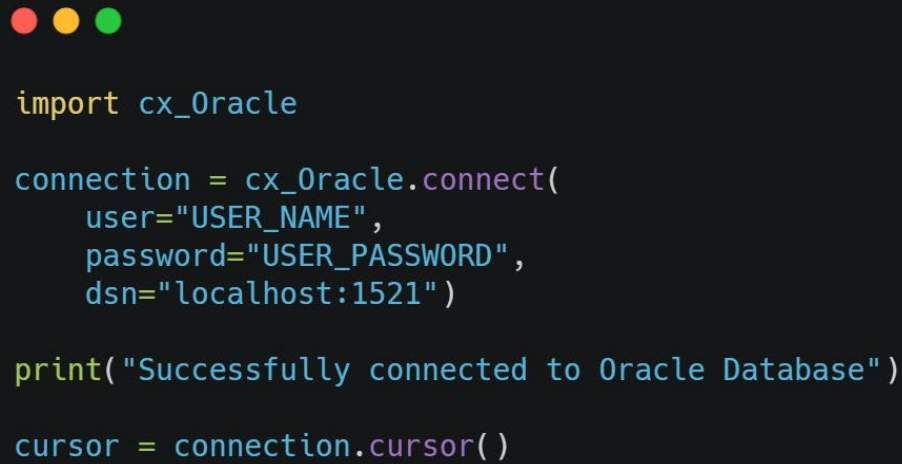
print("Successfully connected to Oracle Database")
```

Execute in conda env

```
Anaconda Prompt (anaconda3)
(database) C:\Users\Sang Hyeon Eum\Desktop>python client.py
Successfully connected to Oracle Database
(database) C:\Users\Sang Hyeon Eum\Desktop>
```

# Oracle system link with Python

- Example (example.py)



```
import cx_Oracle

connection = cx_Oracle.connect(
    user="USER_NAME",
    password="USER_PASSWORD",
    dsn="localhost:1521")

print("Successfully connected to Oracle Database")

cursor = connection.cursor()
```



# Oracle system link with Python

- Example (example.py)

```
# Create a table

cursor.execute("""
    begin
        execute immediate 'drop table todoitem';
        exception when others then if sqlcode <> -942 then raise; end if;
    end;""")

cursor.execute("""
    create table todoitem (
        id number generated always as identity,
        description varchar2(4000),
        creation_ts timestamp with time zone default current_timestamp,
        done number(1,0),
        primary key (id))""")
```

# Oracle system link with Python

- Example (example.py)

```
# Insert some data

rows = [ ("Task 1", 0 ),
          ("Task 2", 0 ),
          ("Task 3", 1 ),
          ("Task 4", 0 ),
          ("Task 5", 1 ) ]

cursor.executemany("insert into todoitem (description, done) values(:1, :2)", rows)
print(cursor.rowcount, "Rows Inserted")

connection.commit()

# Now query the rows back
for row in cursor.execute('select description, done from todoitem'):
    if (row[1]):
        print(row[0], "is done")
    else:
        print(row[0], "is NOT done")
```

# Oracle system link with Python

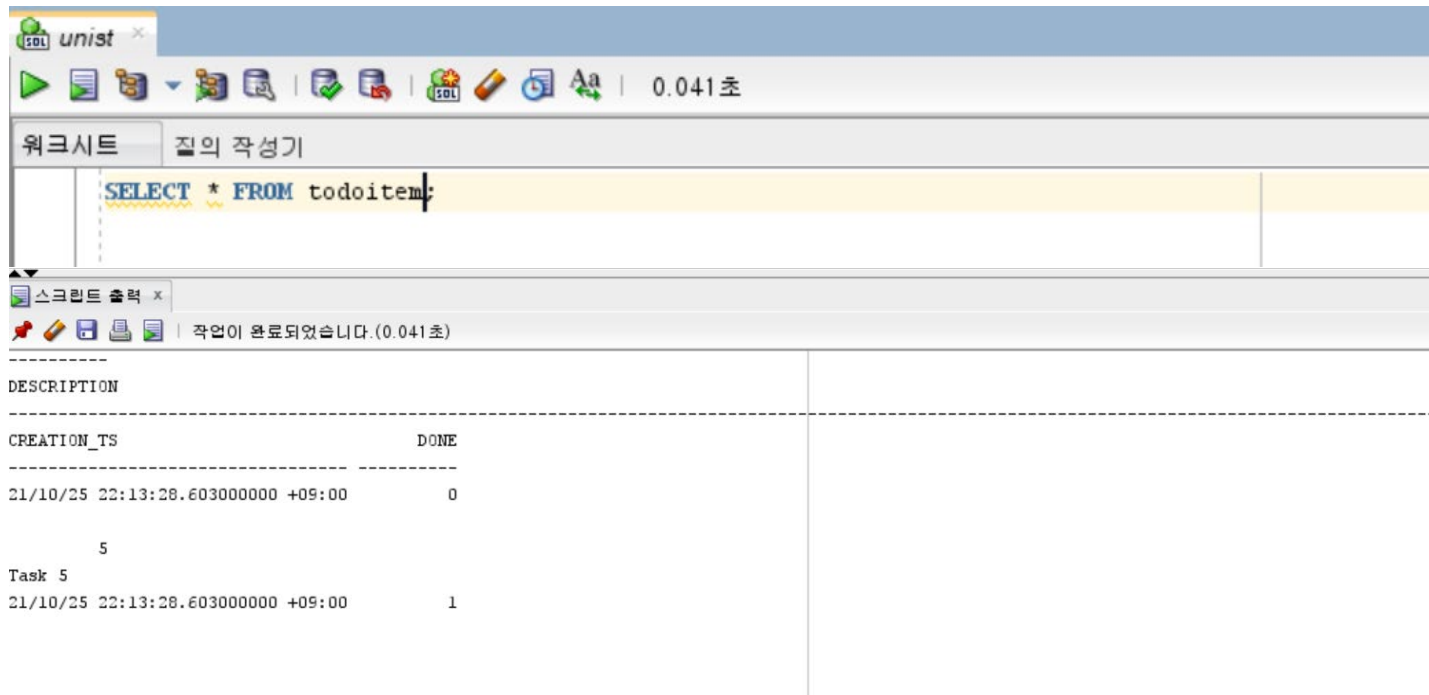
- Example (example.py)

```
Anaconda Prompt (anaconda3)
(database) C:\Users\Sang Hyeon Eum\Desktop>python example.py
Successfully connected to Oracle Database
5 Rows Inserted
Task 1 is NOT done
Task 2 is NOT done
Task 3 is done
Task 4 is NOT done
Task 5 is done

(database) C:\Users\Sang Hyeon Eum\Desktop>
```

# Oracle system link with Python

- Example (example.py)  
We can query in SQLdeveloper



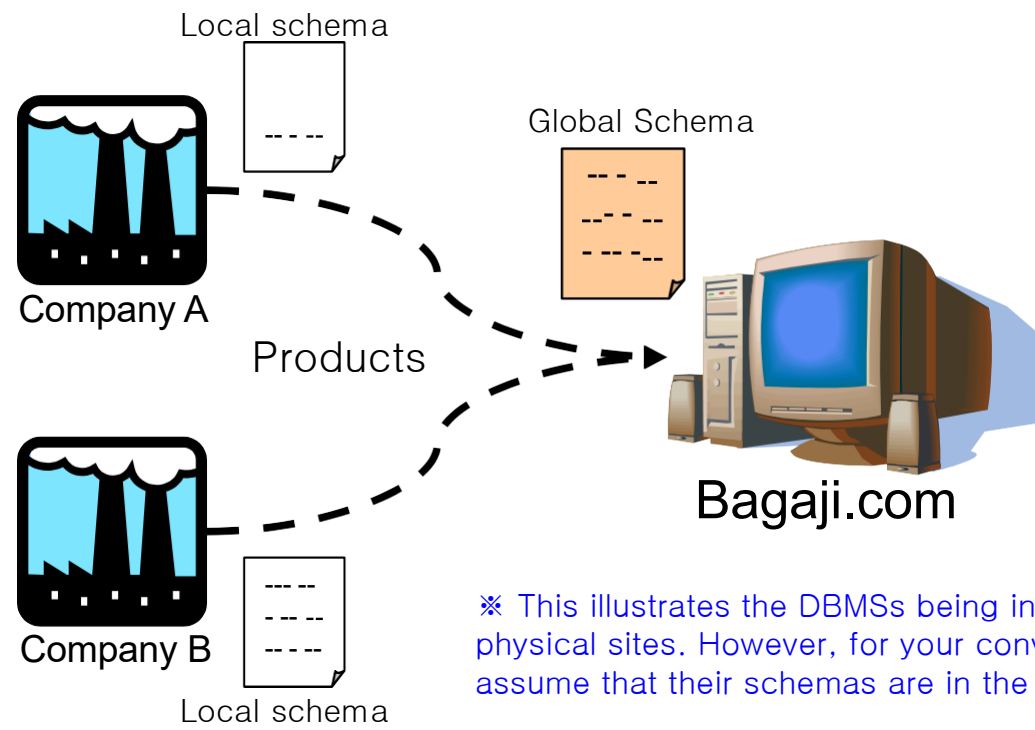
# Resources

- <https://www.oracle.com/database/technologies/appdev/python/quickstartpythononprem.html>

# Specifications

# Schema

- We have local and global schemas



# Local Schema (Company A)

- Schema list
  - desktop(model, price, cpu)
  - laptop(model, price, cpu, weight)
  - hdtv(model, price, screen\_size)
  - pdptv(model, price, screen\_size)
  - lcdtv(model, price, screen\_size)
- Primary key: model
- Data type
  - model: varchar2(20)
  - price, cpu, weight, screen\_size: number



# Local Schema (Company B)

- Schema list
  - pc(model, code, type, price, cpu)
  - server(model, code, price, cpu)
  - tv(model, code, type, price, screen\_size)
- Primary key: model, code
- Data type
  - model, code: varchar2(10)
  - price, cpu, screen\_size: number
  - type: varchar2(1) → type (for PC) = {'D', 'L'}, type (for TV) = {'H', 'P', 'L'}

# Global Schema

- Schema list
  - Computer(name, price, type, cpu, feature)
  - Television(name, price, type, screen\_size)
- Primary key: name
- Data type
  - name: varchar2(21)
  - price, cpu, screen\_size: number
  - feature: varchar2(20)
  - type: varchar2(1) → type (for Computer) = {'D', 'L', 'S'}, type (for Television) = {'H', 'P', 'L'}

# Global Schema

- Table "Computer"
  - Combines "Desktop/Laptop of company A" and "PC/Server of company B" into a single virtual table\*
  - \*Table does not exist in the physical DBMS like a result of "SELECT"

# Global Schema

- Attribute conversion
  - name
    - For company A: 'A' || model: 'D101' of A is named by 'AD101'
    - For company B: 'B' || model || code: 'P809' (model) of B with 'k' (code) named by 'BP809k'
  - type
    - Laptop → 'L', Desktop → 'D', Server → 'S'
    - You can keep L and D in company B
  - feature
    - company A: a copy of 'weight' in company A
    - company B: 'none' is assigned, otherwise
  - price, cpu
    - No conversion is needed

# Global Schema

- Table 'Television'
  - Combines "HDTV/PDPTV/LCDTV of company A" and "TV of company B" into a single virtual table\*
  - \*Table does not exist in the physical DBMS like a result of "SELECT"

# Global Schema

- Attribute conversion
  - name
    - See "Table Computer"
  - type
    - Company A: HDTV → 'H', PDPTV → 'P', LCDTV → 'L'
    - Company B: You can make a copy from that of company B
- price, screen\_size
  - No conversion is needed

# User Interface

- Main
  - The interface offers an UI to browse Computer/Television or update their price
- Example UI:

What are you looking for?

  1. Computer
  2. Television
  3. Price update
  4. Exit

# User Interface

- Computer
  - Select #1 in the main menu
- Example UI:
  - Computer -
    1. Product list
    2. Recommended products
    3. Back



# User Interface

- Television
  - Select #2 in the main menu
- Example UI:
  - Television -
    1. Search by price
    2. Recommended products
    3. Back

# Requirement (Computer)

- Menu #1: Product list
  - List up the products in your virtual table in ascending order by name
  - Print out the product information you convert
- Menu #2: Recommended products
  - List up the products that meet
    - Their price below average\*
    - Their cpu performance above average\*
    - \*Average: average within a company
  - Print out the product information you convert

# Requirement (Television)

- Menu #1: Search by price
  - Input "price" from the user
  - If match, print out the products in ascending order of their name
  - Otherwise, print out "a product" whose price is closest to the user input (print out all the products if they all have the same price)

# Requirement (Television)

- Menu #2: Recommended products
  - List up the products that meet
    - Their price below average\*
    - Their screen size above average\*
    - \*Average: average across all products
  - Find the product that meet the conditions above AND whose size/price ratio is largest among your list
  - Print out the product information you convert

# Requirement (Price update)

- Update your table (records will be changed)
  - Products in Computer
    - Discount the price of a product by 10% if its cpu performance is below average
    - "Then" delete most expensive items
  - Products in Television
    - Increase the price of a product by 10% if its screen size is largest across all the products
    - "Then" delete products if their size-price ratio (i.e.,  $\text{size} \div \text{price}$ ) is largest
- Attention: this alteration may yield different results without table restoration, so please make sure the tables are restored

# Instructions

- Use local schemas and their records (available at Blackboard)
- Solve each sub-problem in the requirements
- Do NOT create Computer and Television tables in your DBMS
- Do NOT add unspecified fields to Computer and Television tables in your DBMS
- Computer and Television tables are virtual; use SELECT instead
- Print out field names of the tables in your results so that we can understand the values associated with their fields
- Please make sure your program can take a credential (login) to DBMS as user input

# Submission

- What to submit
  - Your implementation (py) with comments
  - Instructions of your program (how to use)
  - Do NOT zip your submission (you will lose your point otherwise)
- Where to submit
  - Blackboard
- When to submit by
  - November 17th before the class (by 2:30 pm)
  - No extension – start as soon as possible

# Grading Policy

- Implementation: 80 points
  - Does your program work as intended; are results correct?
- Exception handling and comments in your code: 10 points
  - Can we handle invalid inputs?
  - Can we understand what you write?
- UI: 10 points
  - Can we see the menu and results clearly?
- No late submission
- No copy



# Questions

- Instructor (for specifications)
  - Ilwoo Lyu
  - [ilwoolyu@unist.ac.kr](mailto:ilwoolyu@unist.ac.kr)
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- Check the discussion board in Blackboard