

# Cassandra Java Driver

Big Data Systems

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# Cassandra driver

- Open source —> more than 1...  
Java, Python, Ruby, C#, Nodejs, PHP, C++, Scala and many more
- Just for Java there are more than 5 different vendors
- We will use Datastax's version  
built in support for AstraDB's security API

# Datastax Java Driver

- Previously there were 2 versions
  - OSS - Cassandra
  - DSE - Datastax Enterprise
- Today there is a single driver (OSS) that supports Cassandra, Datastax Enterprise and AstraDB

<https://github.com/datastax/java-driver>

# Installing the driver - option 1

- Using Maven

```
<dependency>  
  <groupId>com.datastax.oss</groupId>  
  <artifactId>java-driver-core</artifactId>  
  <version>${driver.version}</version>  
</dependency>
```

```
<dependency>  
  <groupId>com.datastax.oss</groupId>  
  <artifactId>java-driver-query-builder</artifactId>  
  <version>${driver.version}</version>  
</dependency>
```

```
<dependency>  
  <groupId>com.datastax.oss</groupId>  
  <artifactId>java-driver-mapper-runtime</artifactId>  
  <version>${driver.version}</version>  
</dependency>
```

# Installing the driver - option 2

- Manually install OSS JARs  
and their dependencies
- For HW2 all the JARs will be provided  
you can use Maven if you prefer

# CqlSession

- The main entry point of the driver
- Holds the state and the connections to the cluster  
with built in connection pool
- Executes queries
- Thread safe

# CqlSession - usage (1)

Connection to AstraDB example

```
CqlSession session = CqlSession.builder()  
    .withCloudSecureConnectBundle(Paths.get(pathAstraDBBundleFile))  
    .withAuthCredentials(username, password)  
    .withKeyspace(keyspace)  
    .build();
```

```
// finally (when the server terminate, NOT after a single query)  
session.close();
```

**RTFM** <https://github.com/datastax/java-driver/tree/4.x/manual/core>

# CqlSession - usage (2)

- Create one session per application

```
// Anti-pattern: creating two sessions doubles the number of TCP connections
// opened by the driver
CqlSession session1 = CqlSession.builder().withKeyspace(...).build();
CqlSession session2 = CqlSession.builder().withKeyspace(...).build();
```



# CqlSession - execute

- Executes a **statement** (query)
- Returns a ResultSet
- Sync/Async

Statement

- **SimpleStatement** (created from String)
- **BoundStatement** (created from PreparedStatement)
- **BatchStatement**

# CqlSession - execute (example 1)

```
// simple queries
```

```
session.execute("INSERT INTO users(user_id,name) VALUES(123,'Rubi')");
```

```
// this is alias for
```

```
session.execute(SimpleStatement.newInstance(  
    "INSERT INTO users(user_id,name) VALUES(123,'Rubi')");
```

# CqlSession - execute (example 2)

```
// simple queries with placeholders  
session.execute("INSERT INTO users(user_id,name) VALUES(?,?)",  
                123, 'Rubi');
```

# CqlSession - execute (example 3)

```
// simple query with results  
ResultSet rs = session.execute("SELECT * FROM users WHERE user_id=?", 123);
```

# ResultSet

- An iterable over `Row` objects
- `One()` - Returns the next element, or null if exhausted
- Initialized to a “row before”

# ResultSet - example (1)

```
// simple query with a "single row" result  
ResultSet rs = session.execute("SELECT count(*) FROM users WHERE user_id=?", 123);  
  
Row row = rs.one();  
System.out.println(row.getInt(0));
```



See the table in a few slides for the complete mapping

# ResultSet - example (2)

```
// simple query with a multi rows
```

```
ResultSet rs = session.execute("SELECT * FROM users");
```

```
for (Row row : rs) {
```

```
    System.out.println(row.getInt(0) + " -- " + row.getString("name"));
```

```
}
```

Java iterator

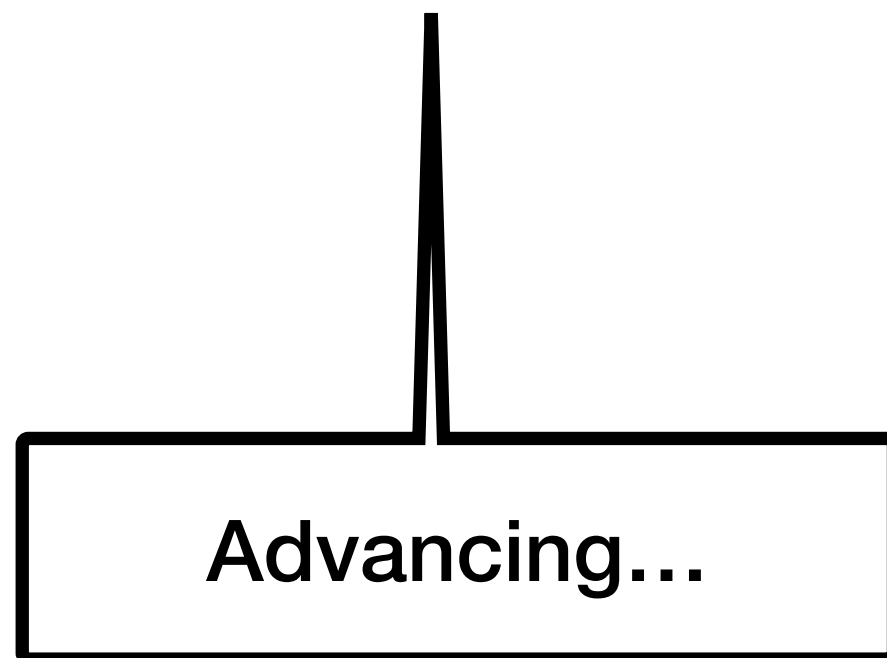
Column by "location"

Column by name

# ResultSet - example (3)

```
// simple query with a multi rows
ResultSet rs = session.execute("SELECT * FROM users");

Row row = rs.one();
while (row != null) {
    System.out.println(row.getInt(0) + " -- " + row.getString("name"));
    row = rs.one();
}
```





# ResultSet - CQL to Java mapping (1)

CQL3 data type	Getter name	Java type	See also
ascii	getString	java.lang.String	
bigint	getLong	long	
blob	getByteBuffer	java.nio.ByteBuffer	
boolean	getBoolean	boolean	
counter	getLong	long	
date	getLocalDate	java.time.LocalDate	<u>Temporal types</u>
decimal	getBigDecimal	java.math.BigDecimal	
double	getDouble	double	
duration	getCqlDuration	<u>CqlDuration</u>	<u>Temporal types</u>
float	getFloat	float	
inet	getInetAddress	java.net.InetAddress	
int	getInt	int	
list	getList	java.util.List	
map	getMap	java.util.Map<K, V>	
set	getSet	java.util.Set	

# ResultSet - CQL to Java mapping (2)

CQL3 data type	Getter name	Java type	See also
smallint	getShort	short	
text	getString	java.lang.String	
time	getLocalTime	java.time.LocalTime	<a href="#">Temporal types</a>
timestamp	getInstant	java.time.Instant	<a href="#">Temporal types</a>
timeuuid	getUuid	java.util.UUID	
tinyint	getByte	byte	
tuple	getTupleValue	<a href="#">TupleValue</a>	<a href="#">Tuples</a>
user-defined types	getUDTValue	<a href="#">UDTValue</a>	<a href="#">User-defined types</a>
uuid	getUuid	java.util.UUID	
varchar	getString	java.lang.String	

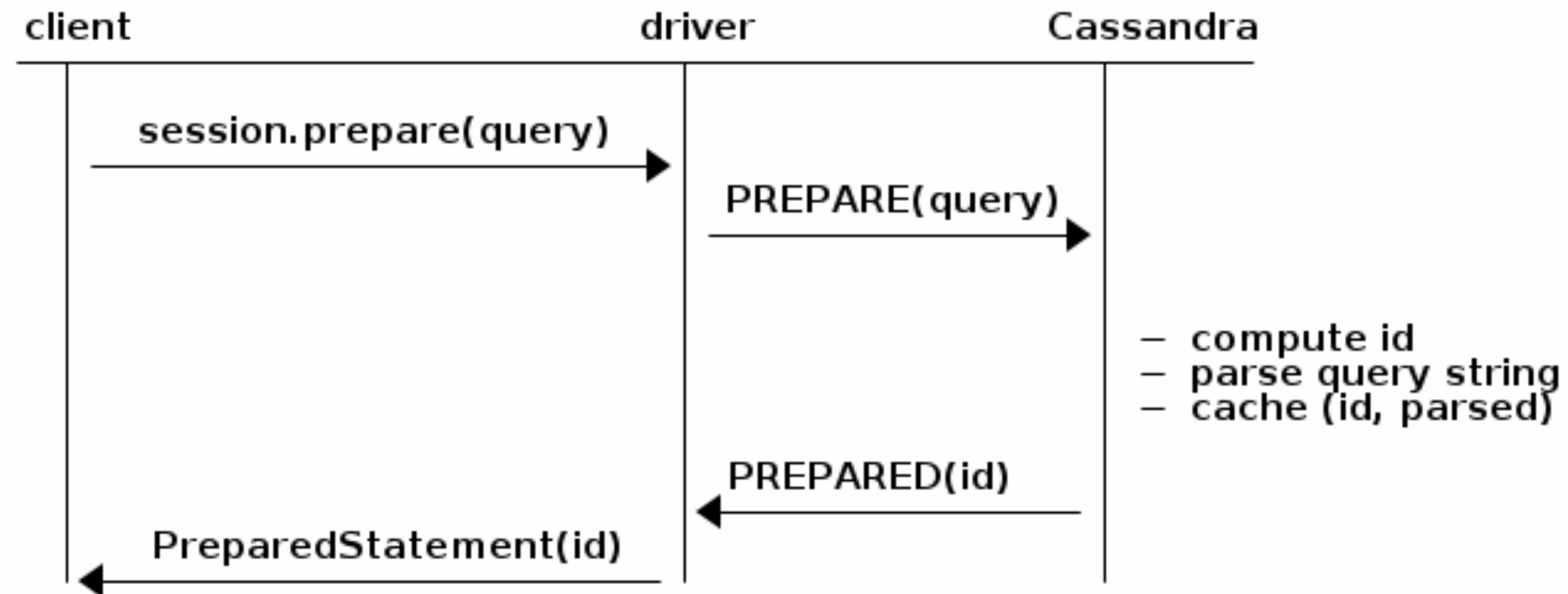
# Prepared statements

Prepare a query string once, reuse with different values

- More efficient than simple statements for queries that are **used often**
- Requires query to be “saved” on the servers  
thus - do not use with infrequent queries

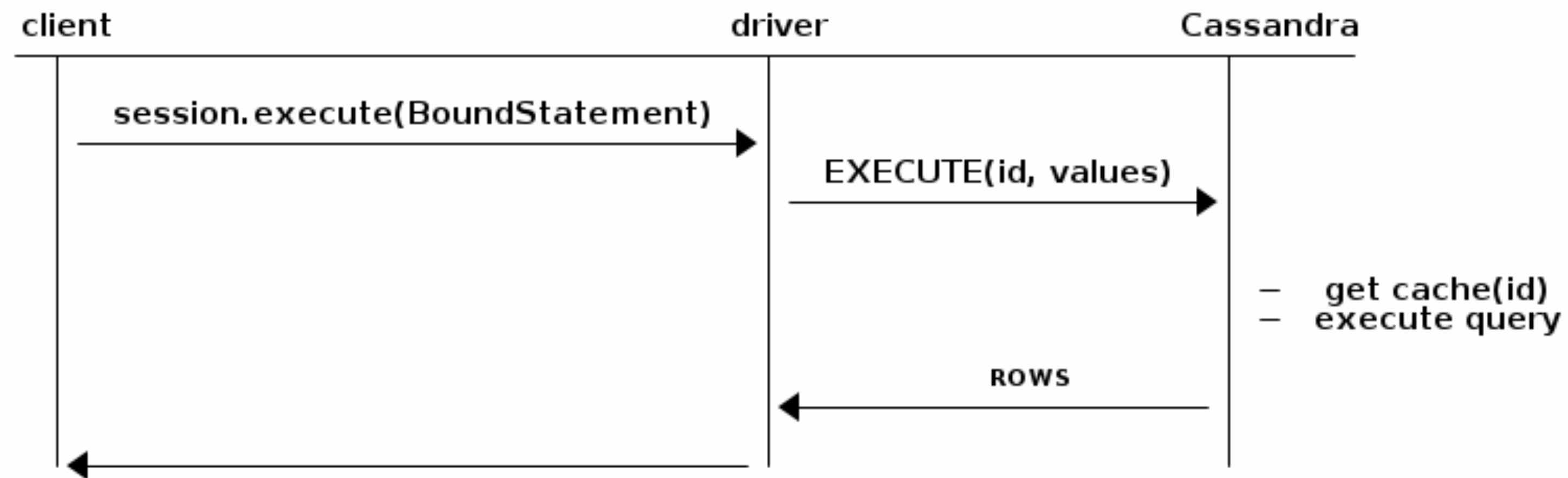
# Prepared statements - logic (1)

- Cassandra stores the cached query on server



# Prepared statements - logic (1)

- For queries, the cache id and raw value are sent



# Prepared statements - advantages

- Saving parsing overhead
- Result set metadata is cached on the driver  
saves bandwidth / resources
- Better CQL data types check  
on driver, not on server
- **Calculates the partition key on the driver**
- More optimizations

# Prepared statements - example (1)

```
// query using prepared statement (insert)
PreparedStatement pstmt =
    session.prepare("INSERT INTO users(user_id, name, age) VALUES(?,?,?);

BoundStatement bstmt = pstmt.bind()
    .setLong(0, 123)
    .setString(1, "Rubi Boim)
    .setInt(2, 21);

session.execute(bstmt);
```

# Prepared statements - example (2)

```
// query using prepared statement (select)
PreparedStatement pstmt =
    session.prepare("SELECT * FROM users WHERE user_id=?");

BoundStatement bstmt = pstmt.bind()
    .setLong(0, 123);

ResultSet rs = session.execute(bstmt);
```



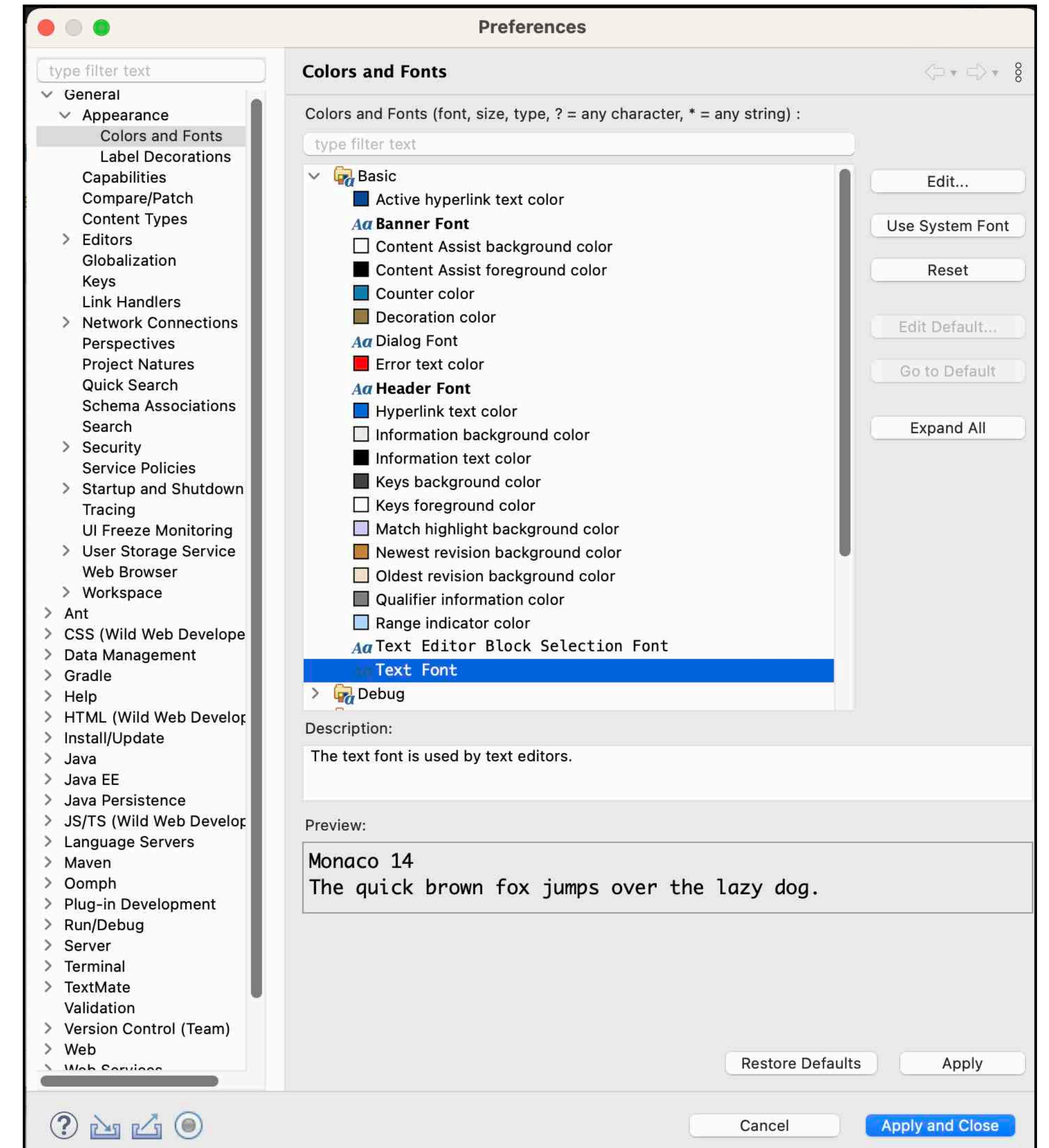
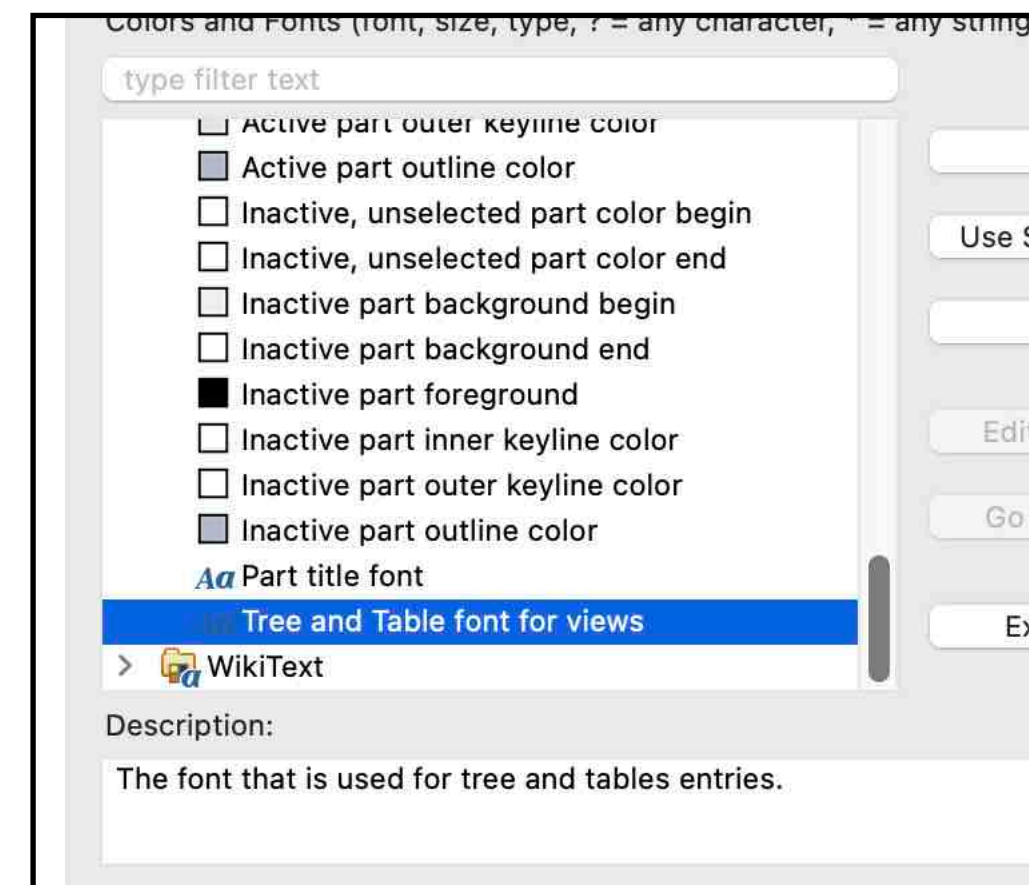
# HW2

# For HW2 - Checklist

1. Install Java & Eclipse
2. Create a new workspace
3. Create a new Java project
4. Create “hello world” program
5. Copy HW2 and test
  - Run a few commands from CassandraExample
  - Run the HW2CLI
  - Export to JAR
6. Implement HW2

# New workspace tips (1)

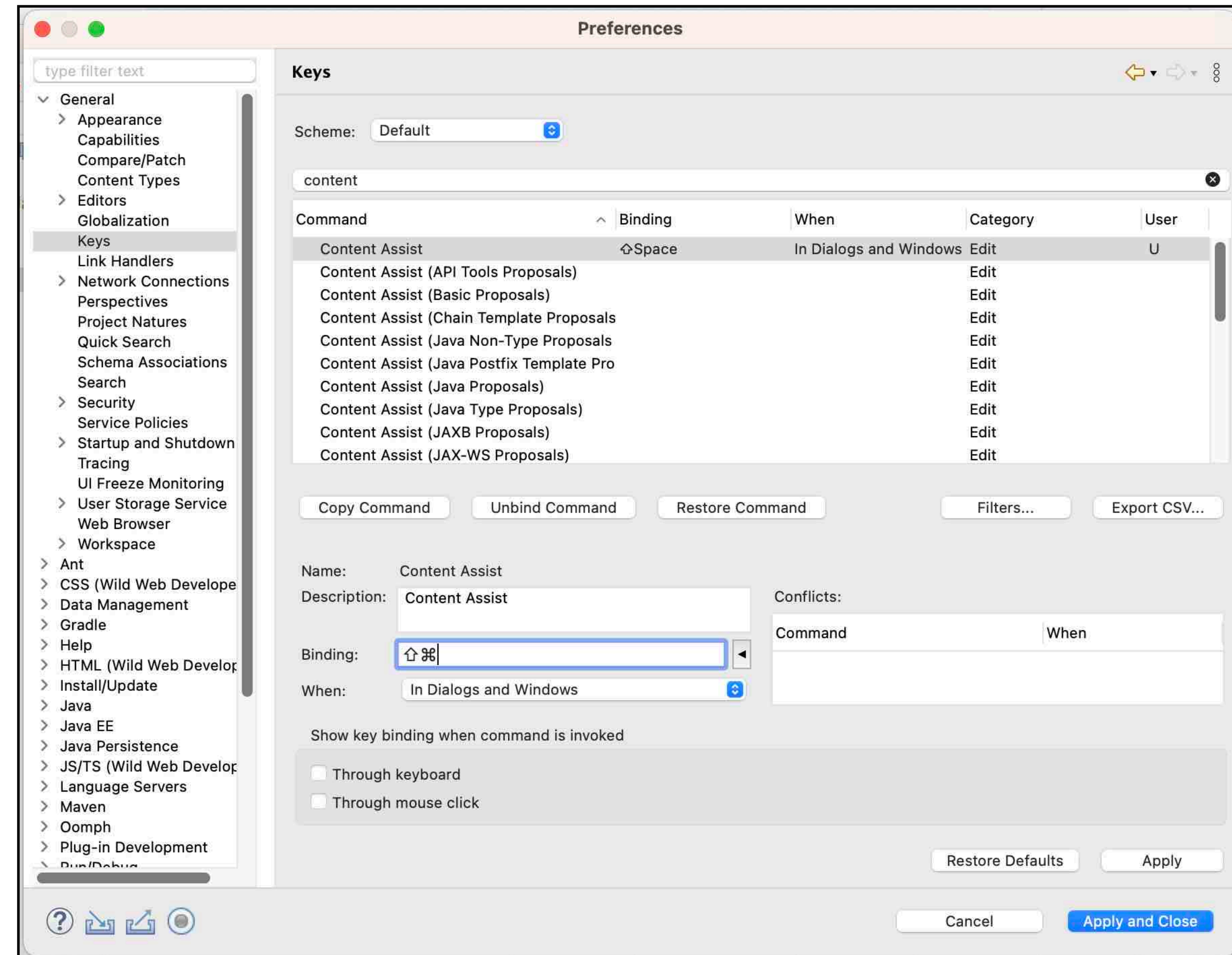
- Increase fonts
  - Basic —>  
Text font —>  
Monaco 14
  - View and editor folders —>  
Tree and table font for views —>  
Monaco 14



# New workspace tips (2)

- Set up content assist  
In Mac, Ctrl+Space is already bind to “language switch” ...

Use Shift+Space



Sample App Gallery

Looking to get up and running?  
Get started with a sample app!

You can connect to your database in a few different ways

Use the Astra DB REST API, GraphQL API, Document API or download the secure connect bundle to connect with DataStax drivers.

Connect using an API

Learn More

Document API

GraphQL API

REST API

Connect using a driver

Learn More

Node.js

Python

**Java**



C++

C#

Connect using an SDK

JavaScript SDK

Python SDK

Java SDK

Connect using a gRPC client

Download your **Secure Connect Bundle**

If you have multiple regions, you will have the option to download a bundle for each region.

Download Bundle

Using the Java driver to connect to your database

Use the Java driver to connect to your database and begin building your own application.

Prerequisites

1. Use the **Download Bundle** button at the top of this page to obtain connection credentials to your database.
2. **Download** and **install** Maven.
3. An Application Token (create a new one [here](#)) with the appropriate role set (RO User is needed for example below).

Steps

These steps assume you will be using the maven build system. For help using other Java build systems click the [change build system](#) link.

1. Open the `build.gradle` file, ensuring that the name of the dependency

corresponds to the installed version:

```
<dependency>
  <groupId>com.datastax.astra</groupId>
  <artifactId>astra-java-driver</artifactId>
  <version>1.0.0</version>
</dependency>
```

Download (1)

For HW2 you would need

- “Secure Connect Bundle”
- Application Token

Download (2)

Current Organization  
**boim@post.tau.ac.il**

User Management

Role Management

**Token Management**

Billing & Payment

Security Settings

### Token Management

#### Application Tokens

##### Generate a new token

Select which role you want to attach to your token. The permissions for that role will be displayed before generating your token to ensure you give your application the right permissions.

Select Role

Select Role

Generate Token

Once you select a role above, the role permissions will be displayed here.

For more information about role permissions, see [User permissions](#).

#### Manage existing tokens

Client ID	Generated on	Role
JSXqksRSRwvtXDoxsKjCZmjM	Dec 08, 2021	Admin User

1 generated tokens total

Looking to manage your service account? [Edit your settings here](#).

You will only have access to a service account if you have a classic database that was created before 4 March 2021 that has not been updated to the newest authentication model. The service account is used to interact with the [DevOps API](#).

Choose "Administrator User"

Organizations / boim@post.tau.ac.il

Current Organization  
boim@post.tau.a...

User Management

Role Management

Token Management

Billing

Security Settings

### User Management

#### User Accounts

Invite User

User	Roles	Status
boim@post.tau.ac.il	1	Active
1 user total		

You would also to invite a user and provide administrator access

# Invite Users



## Enter an email address

You may enter a single email address you'd like to invite.

## Select roles for this user

Below are roles you can assign to users of an organization. If you're looking for more granularity, you can create a custom role.

**Organization Access**  
1 of 6 role selected

Administrator User

Organization Administrator

Billing Administrator

Database Administrator

UI View Only

Administrator Service Account

**Database, Keyspace, or Table Access**  
0 of 4 role selected

**API Access**  
0 of 6 role selected

**Custom Roles**  
0 of 5 role selected

Live Chat | ? | Rubi Boim

Invite User

Roles	Status
1	Active

You would also to invite a user and provide administrator access