

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/apache/cassandra-java-driver>

Installing the driver - option 1

- Using Maven

```
<dependency>  
  <groupId>org.apache.cassandra</groupId>  
  <artifactId>java-driver-core</artifactId>  
  <version>${driver.version}</version>  
</dependency>
```

```
<dependency>  
  <groupId>org.apache.cassandra</groupId>  
  <artifactId>java-driver-query-builder</artifactId>  
  <version>${driver.version}</version>  
</dependency>
```

```
<dependency>  
  <groupId>org.apache.cassandra</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://apache.github.io/cassandra-java-driver/>

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");
```

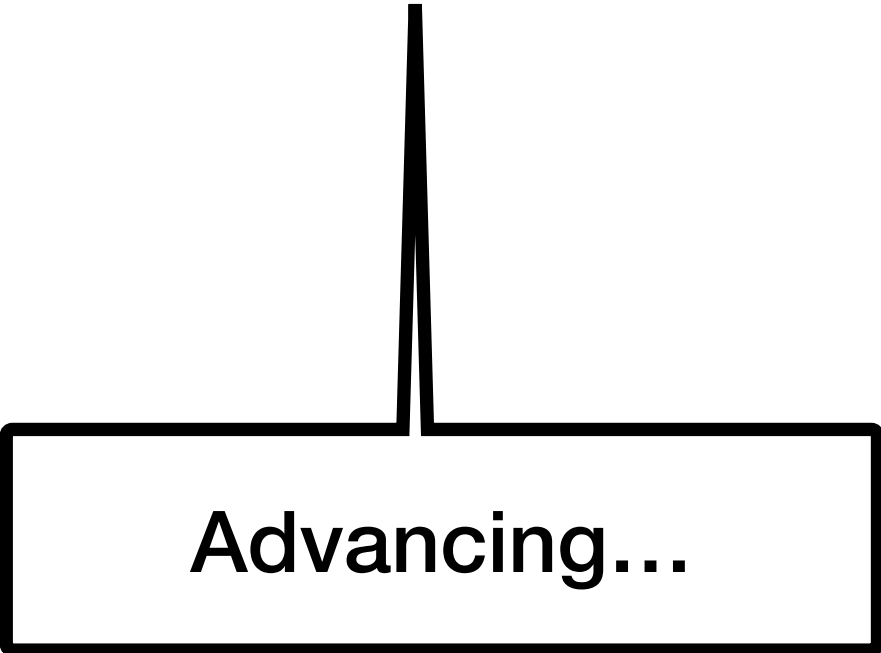
```
Row row = rs.one();
```

```
while (row != null) {
```

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

```
    row = rs.one();
```

```
}
```



Advancing...

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	Temporal types
decimal	getBigDecimal	java.math.BigDecimal	
double	getDouble	double	
duration	getCqlDuration	CqlDuration	Temporal types
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	Temporal types
timestamp	getInstant	java.time.Instant	Temporal types
timeuuid	getUuid	java.util.UUID	
tinyint	getByte	byte	
tuple	getTupleValue	TupleValue	Tuples
user-defined types	getUDTValue	UDTValue	User-defined types
uuid	getUuid	java.util.UUID	
varchar	getString	java.lang.String	

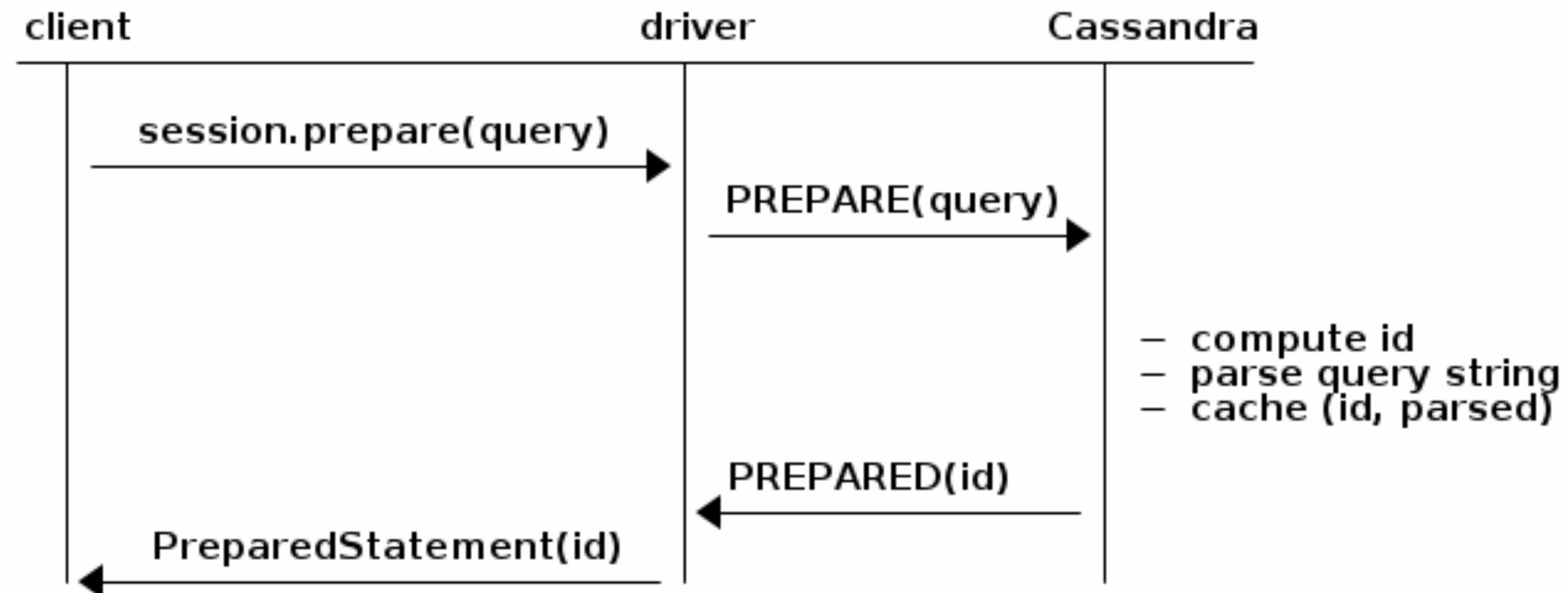
Prepared statements

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

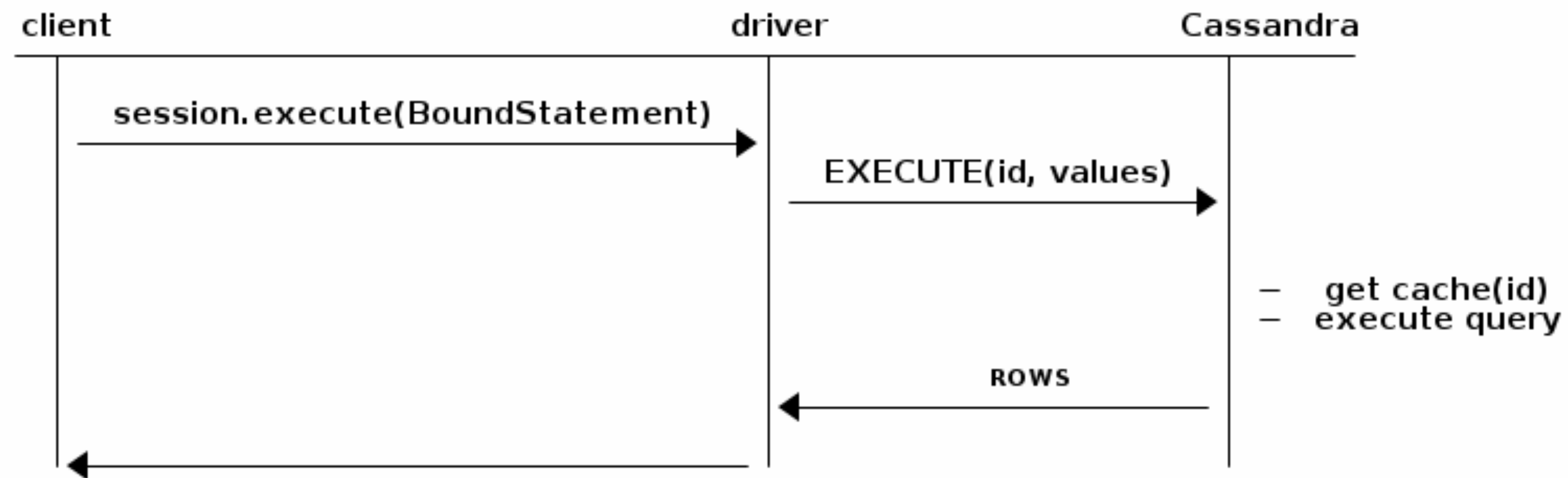
Prepared statements - logic (1)

- 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);
```

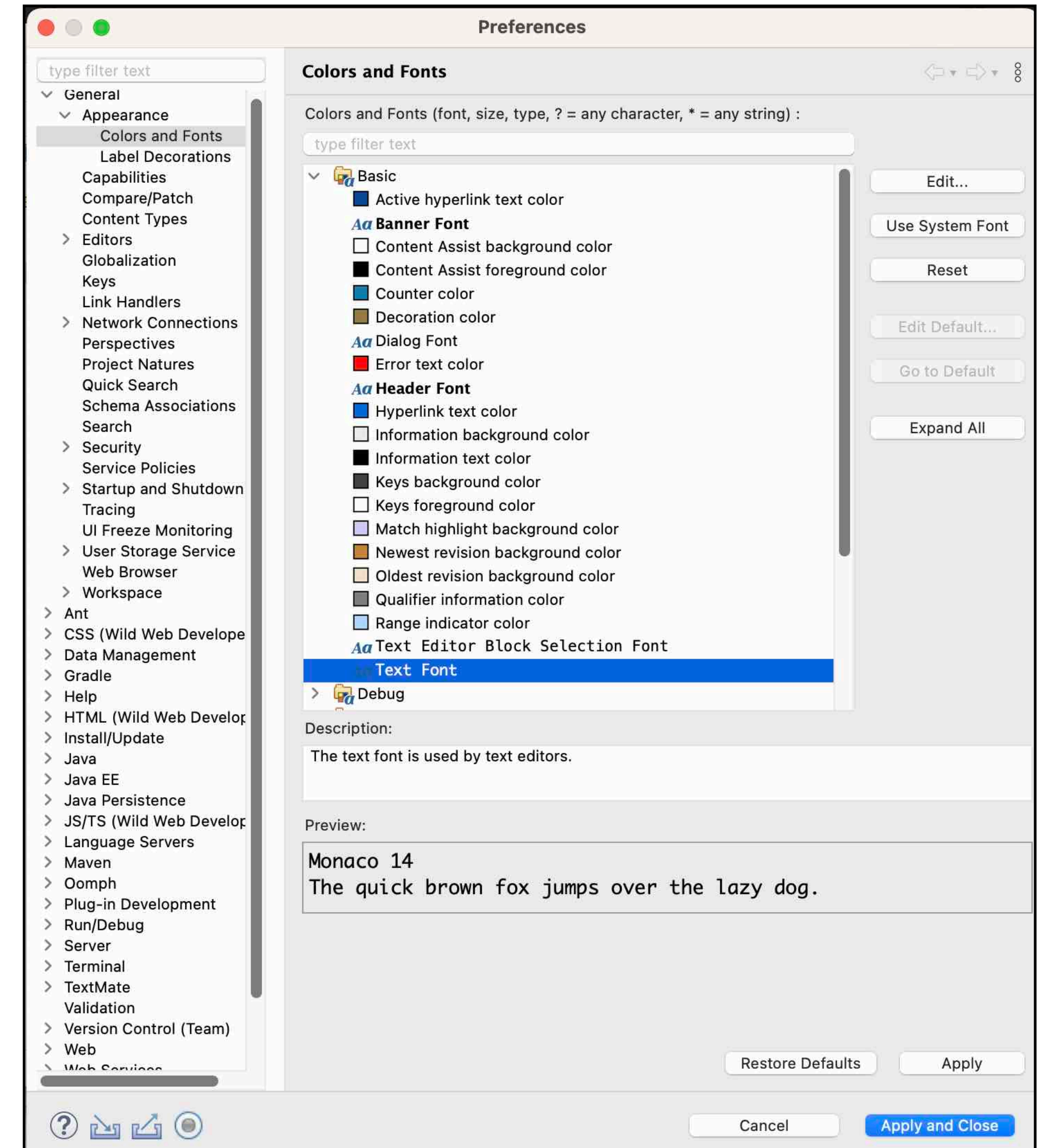
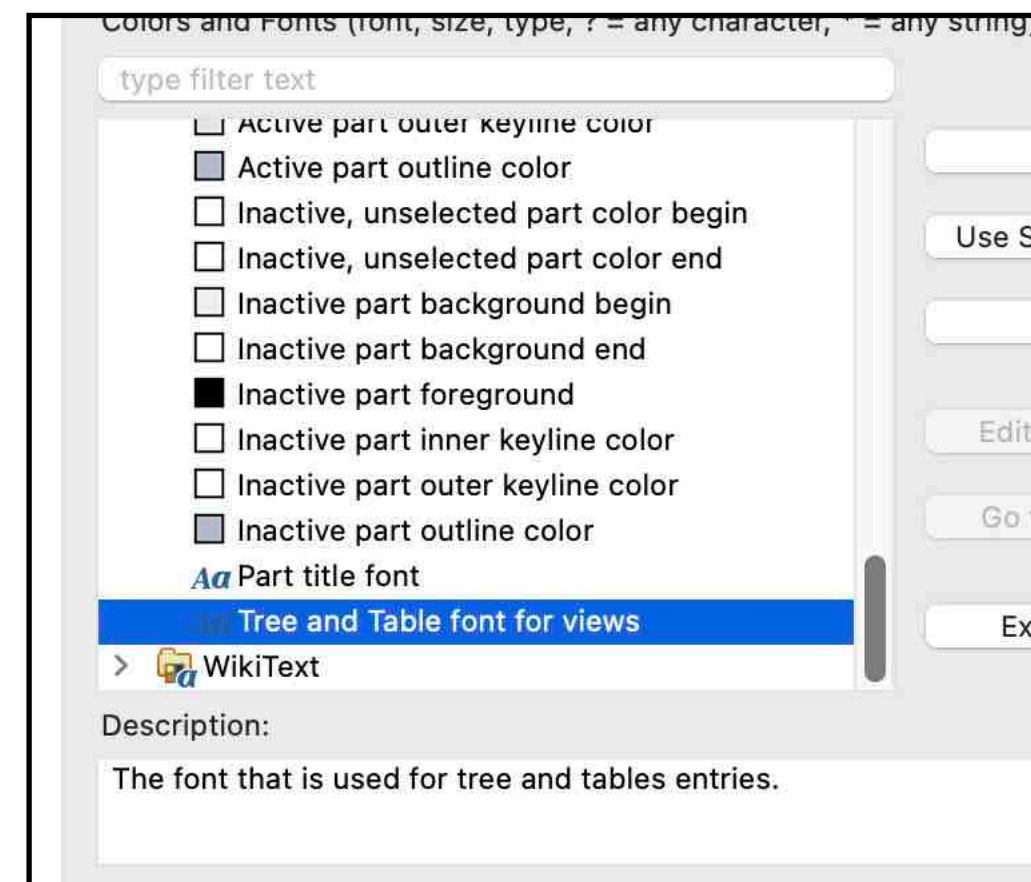

HW2

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)

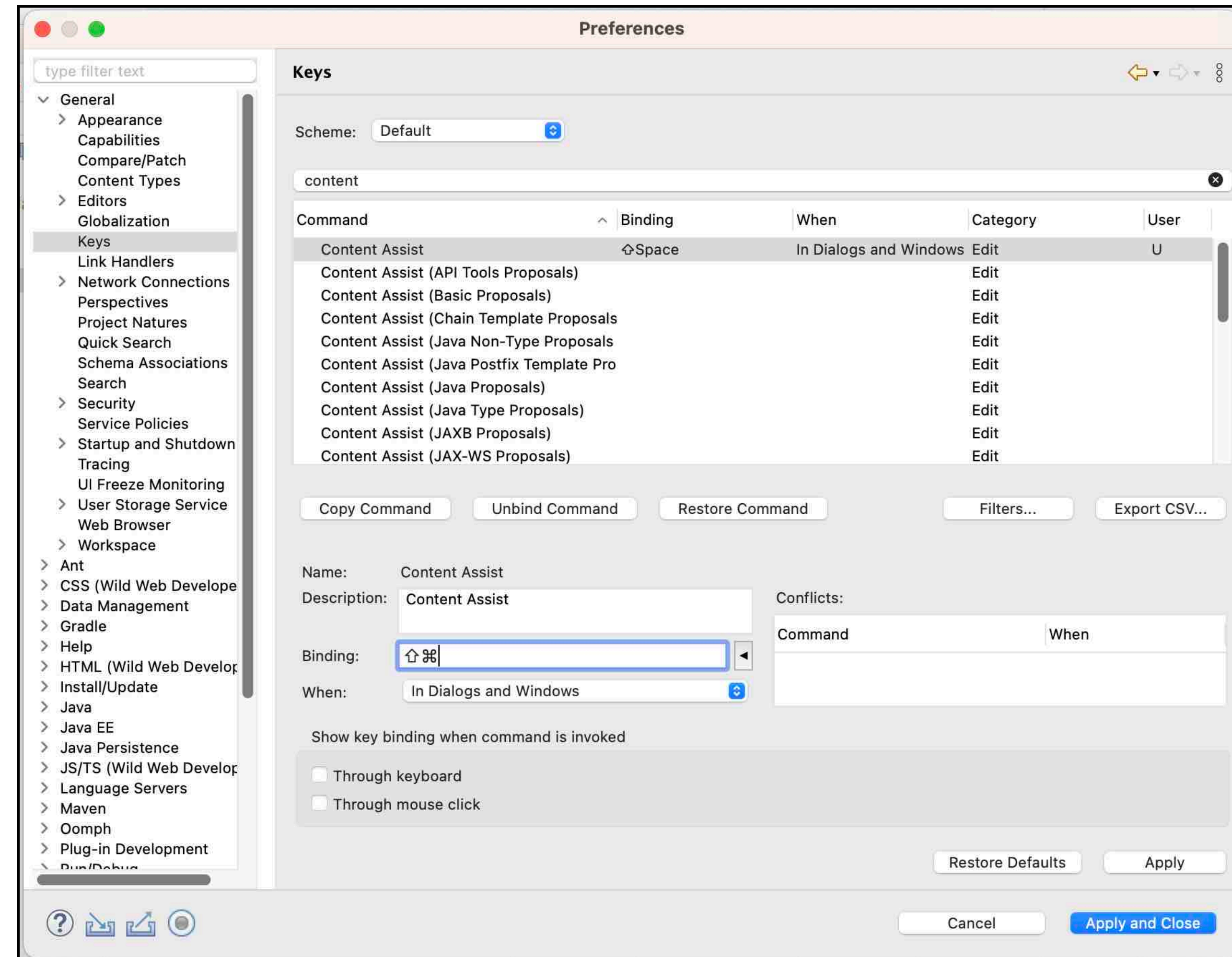
- Increase fonts
 - Basic —>
Text font —>
Monaco 14
 - View and editor folders —>
Tree and table font for views —>
Monaco 14



New workspace tips (2)

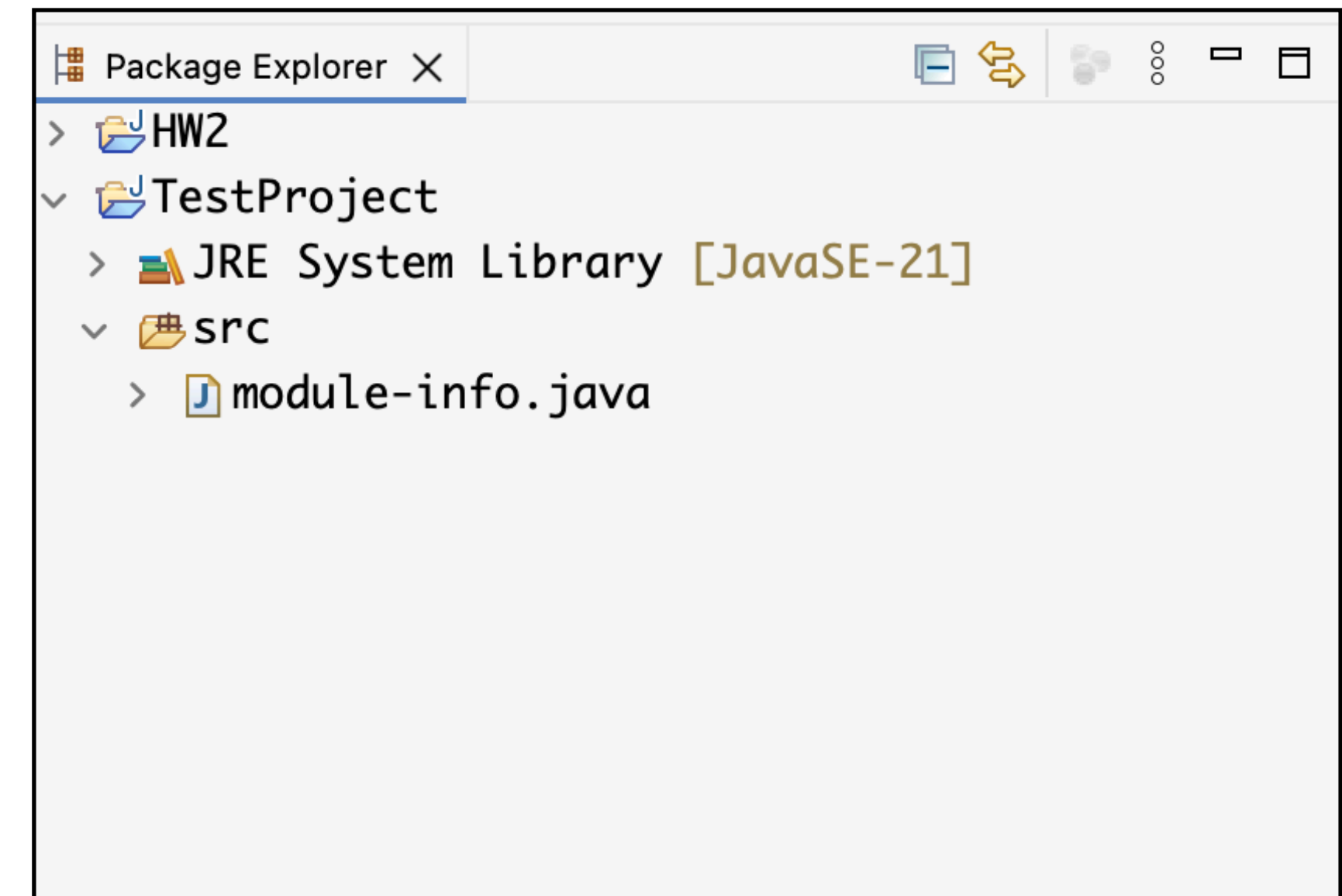
- Set up content assist
In Mac, Ctrl+Space is already bind to “language switch”...

Use Shift+Space



New workspace tips (3)

- Delete the “module-info.java” when you create a new project Eclipse will automatically create the file. delete it to avoid linking issues



HW2 :: Active

ID 2db24957-aa51-4125-ab30-9c9023f71a74 • API_ENDPOINT  AWS eu-west-1 https://2db24957-aa51-4125-a...

Overview Health Connect CQL Console CDC Settings

Database Essentials

Get an application token

Application Tokens enable you to securely connect to your Astra database. [Generate a token scoped to this database](#), [create a custom organization token](#), or [review the full list of role permissions](#) for more information.

Database Administrator

Expiration *

Never expire

Generate Database Token

This token will never expire.

Get a Secure Connect Bundle

Use Secure Connect Bundles when connecting to your database with drivers. Secure Connect Bundles contain the SSL and TLS artifacts needed for your app.

Get Bundle

Install Astra CLI

Use Astra remotely with the [Astra CLI](#) to execute database commands, run the CQL shell, and more. You can follow our step-by-step [Astra CLI guide](#) for more.

```
brew install datastax/astra-cli/astra-cli
```

Download...

For HW2 you would need “Secure Connect Bundle”

boim@cs.tau.ac.il

Application Tokens

Generate New Token

Choose a role for your token, and preview its permissions before generating to ensure accurate application access. Explore more in our [permissions overview](#).

Role *

Administrator User

Description

hw2 user

Expiration *

Never expire

Generate token

This token will never expire.

Role Permissions for Administrator User

- | | | | |
|-------------------------------|------------------------------|-----------------------------------|-----------------------|
| ✓ View DB | ✓ Write User | ✓ Read User | ✓ Create DB |
| ⊘ Write Organization | ✓ Read Organization | ⊘ Terminate DB | ⊘ Write Custom Role |
| ⊘ Read Custom Role | | ⊘ Write External Auth | ⊘ Read External Auth |
| ⊘ Read Audits | | ⊘ Read Token | ✓ Write Billing |
| ✓ Read Billing | ⊘ Delete Custom Role | ⊘ Write IP Access List | ⊘ Read IP Access List |
| ✓ Add Peerings | ✓ Write CMK Key | ✓ Read CMK Key | ⊘ Read Integrations |
| | | | ✓ Manage Metrics |
| | | | ✓ Alter Keyspace |
| | | | ✓ Drop Keyspace |
| | | | |
| ✓ Grant Keyspace | ✓ Modify Keyspace | ✓ Select Table | |
| ✓ Modify Table | ✓ Describe Table | ✓ Create Table | |
| ✓ Alter Table | ✓ Drop Table | ✓ Access GraphQL | |
| ✓ Access CQL | ✓ Manage Migrator Proxy | ✓ Password Reset | ✓ Suspend DB |
| ⊘ Write Langflow Organization | ⊘ Read Langflow Organization | ⊘ Terminate Langflow Organization | ⊘ Write Langflow IDE |
| ⊘ Read Langflow IDE | ⊘ Delete Langflow IDE | ⊘ Build Langflow IDE | ⊘ Write Langflow Flow |
| ⊘ Read Langflow Flow | ⊘ Delete Langflow Flow | ⊘ Run Langflow Flow | |

Choose Administrator

For HW2 you would need “Application Token”

Download...

← Back to portal

 My Account

Profile

 boim@cs.tau.ac.il

General

Users

Roles

Tokens

Integrations

Billing

Security

Invite user and provide **all** roles

User Management

Invite user

Q Search users...



Comfortable

Condensed

User	Roles	Status	
boim@cs.tau.ac.il Admin	1	active	

Page Size: 10  |< < Page 1 of 1 > >|

For HW2 you would need to provide access in order to check your assignment



Invite user and provide ***all*** roles

e user

ESC



Email address

see email address in hw2

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
7 of 7 role selected



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



API Access
6 of 6 role selected



Custom Roles
1 of 1 role selected



Invite user

For HW2 you would need to provide
access in order to check your
assignment