

# 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();
}
```



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	<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	

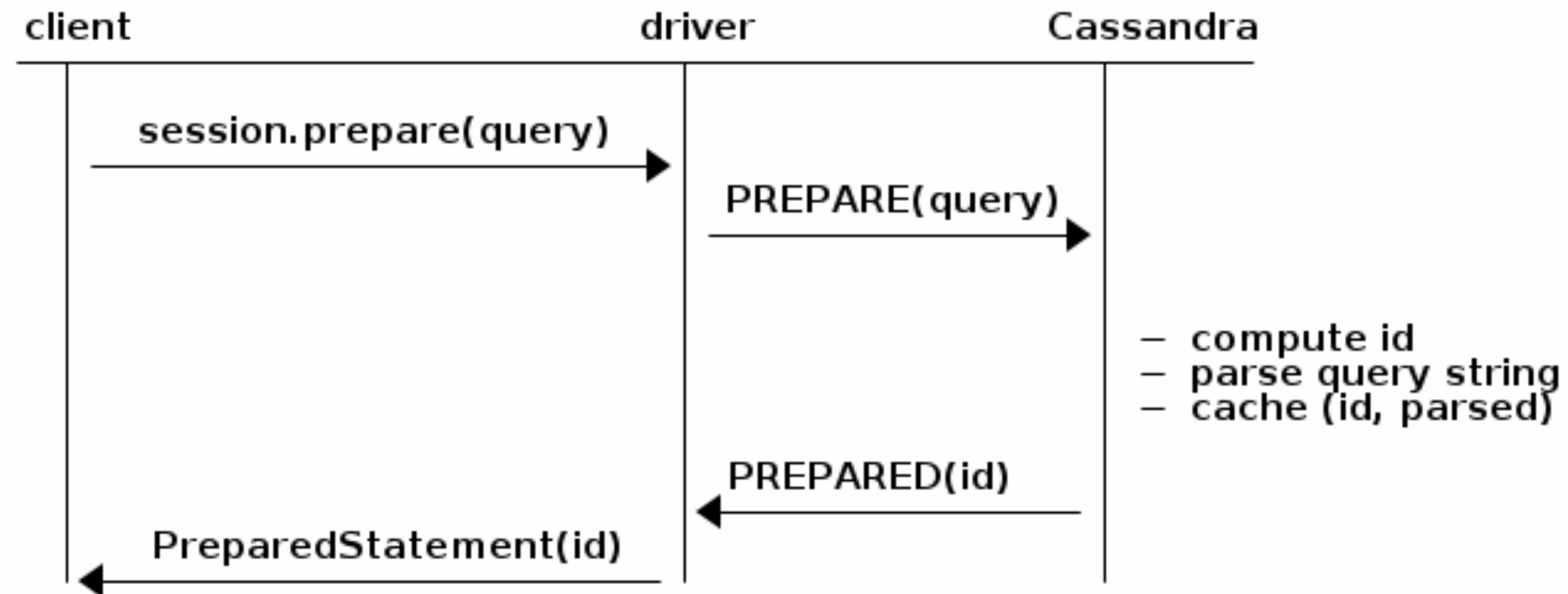
# Prepared statements

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

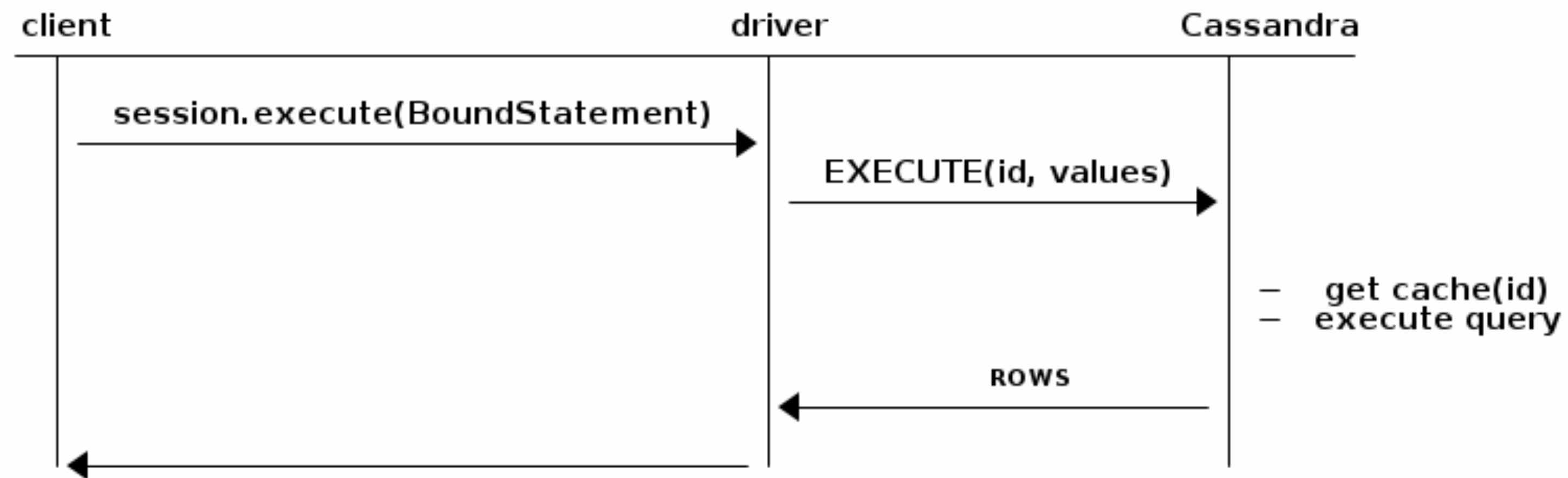
# Prepared statements - logic (1)

- 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);
```



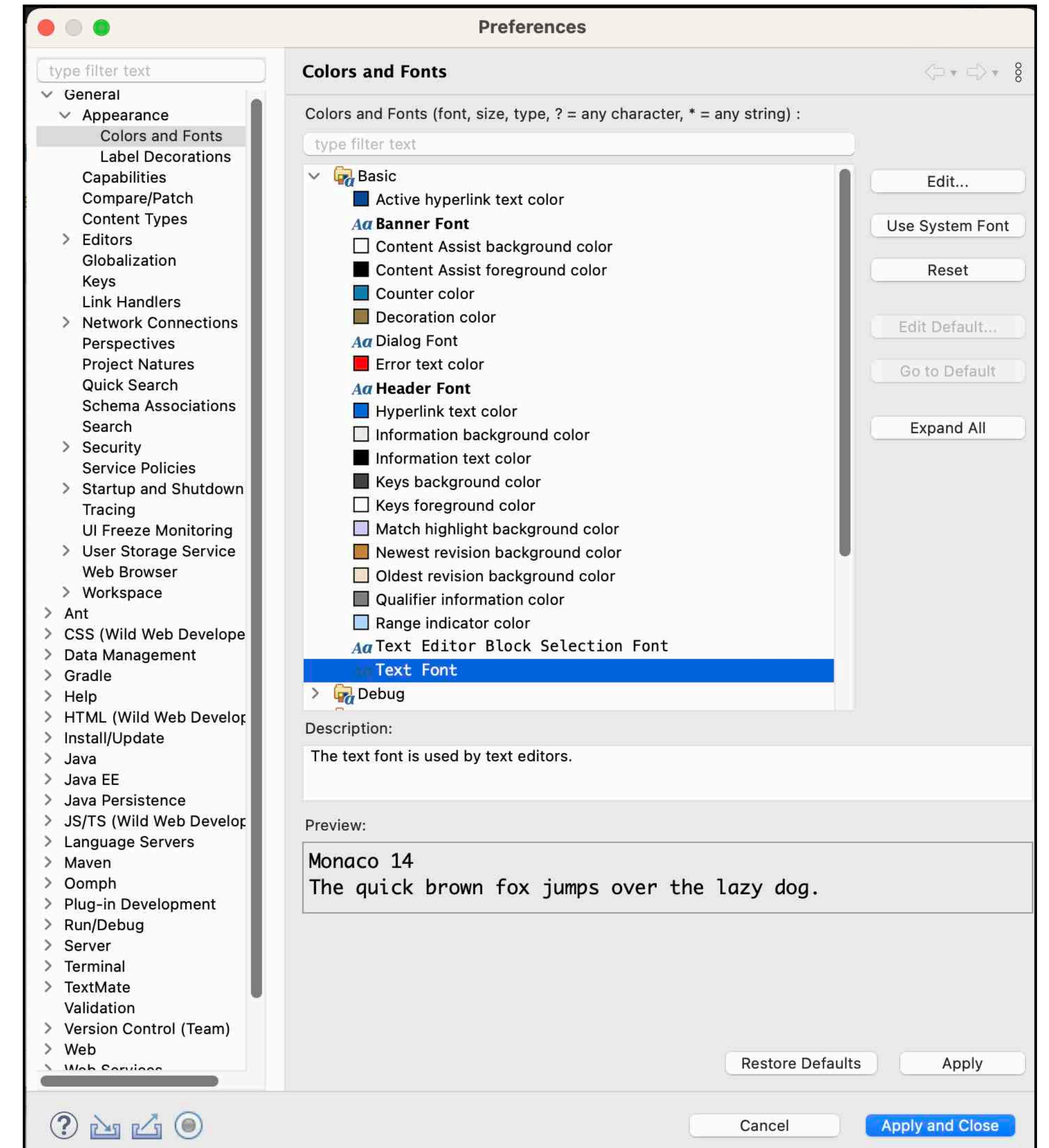
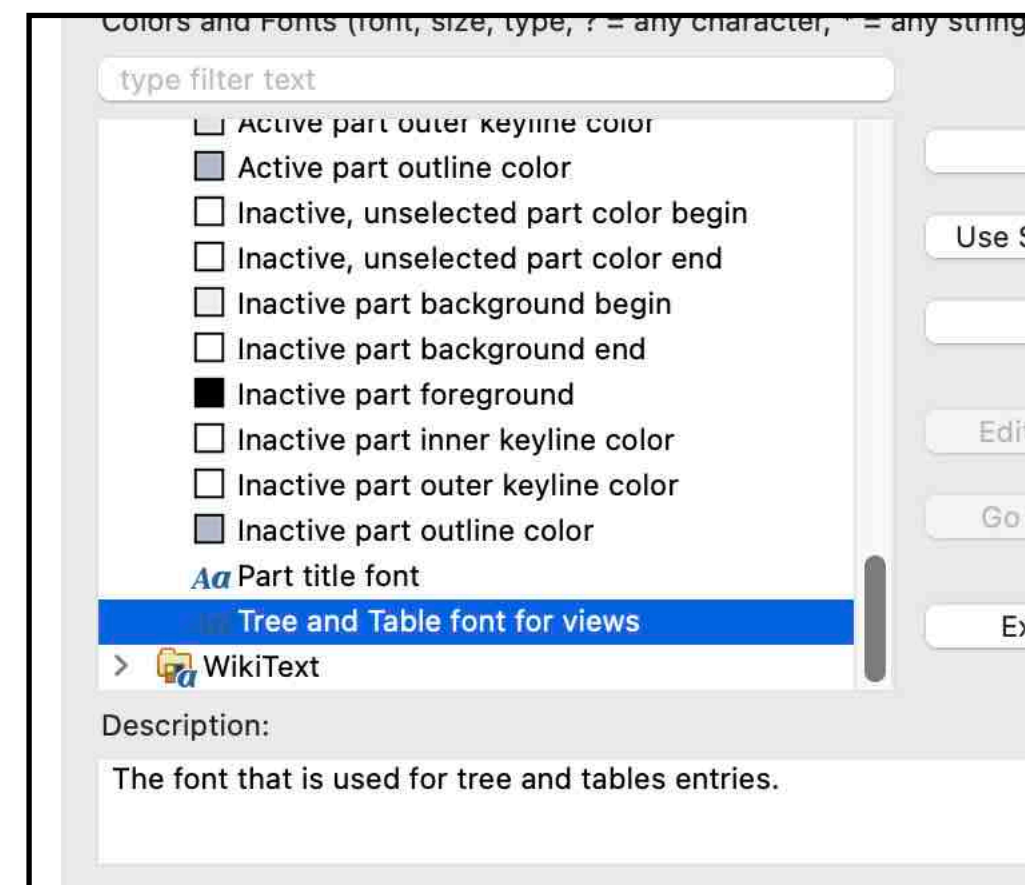
# HW2

# 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)

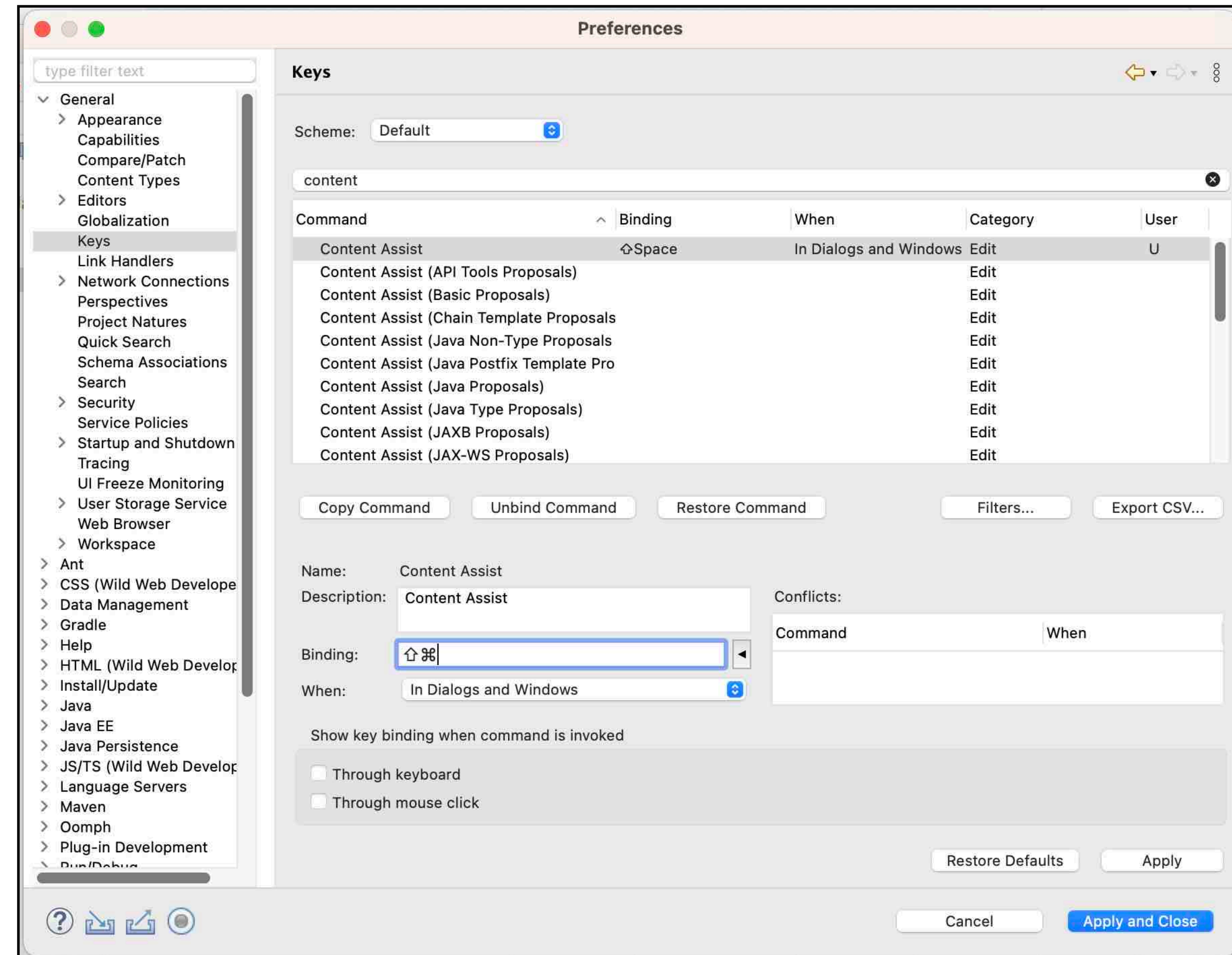
- Increase fonts
  - Basic —>  
Text font —>  
Monaco 14
  - View and editor folders —>  
Tree and table font for views —>  
Monaco 14



# New workspace tips (2)

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

Use Shift+Space



DS boim@post.tau.a... Astra DB Docs

Home Databases **HW2** testrubi Streaming Billing Tokens Integrations Settings

Dashboard / Serverless Databases

**HW2** Active 4b1924b7-2e0f-4c9a-8206-c782733c0277

Load Data **Connect**

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 **Generate Database Token**

**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
```

For HW2 you would need

- “Secure Connect Bundle”

Download

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Home / Organization Settings

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

Users Roles **Tokens** Integrations Billing Security

### 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*	Description
Administrator User	hw2 user

Generate Token

For HW2 you would need

- Application Token

Choose Administrator

DS boim@post.tau.a... Astra DB

- Home
- Databases
- HW2
- testrubi
- Streaming
- Billing
- Tokens**
- Integrations
- Settings

Home / Organization Settings

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

Users Roles **Tokens** Integrations Billing

### Application Tokens

Generate New Token

Choose a role for your token, and p

Role\*

Administrator User

### Token Details

ESC X

Copy or download token details in a secure location before leaving this dialog. While you can always generate a new token, you won't have access to this token later.

Application Token Details

```
{
  "clientId": "WbBYhUqiovFLqxKcTdBZxlaX",
  "secret": "3DHj9Z.WB1z70C9+i6r+Xl29PwLKbBGPuJN8gca5x4cjWwPcB6ZK7eN
  "token": "AstraCS:WbBYhUqiovFLqxKcTdBZxlaX:d548a33fe8febae0e93348f
}
```

Download Token Details ↓

boim@post.tau.ac.il-token.json (1KB)

Close

For HW2 you would need

- Application Token

Choose Administrator

Download...

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		

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

Invite user and provide \*all\* roles



DataStax  
**Astra**

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

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

**Invite user** ESC ✕

**Enter an email address**

Email address

**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

**Invite user**

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

Invite user and pro