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)

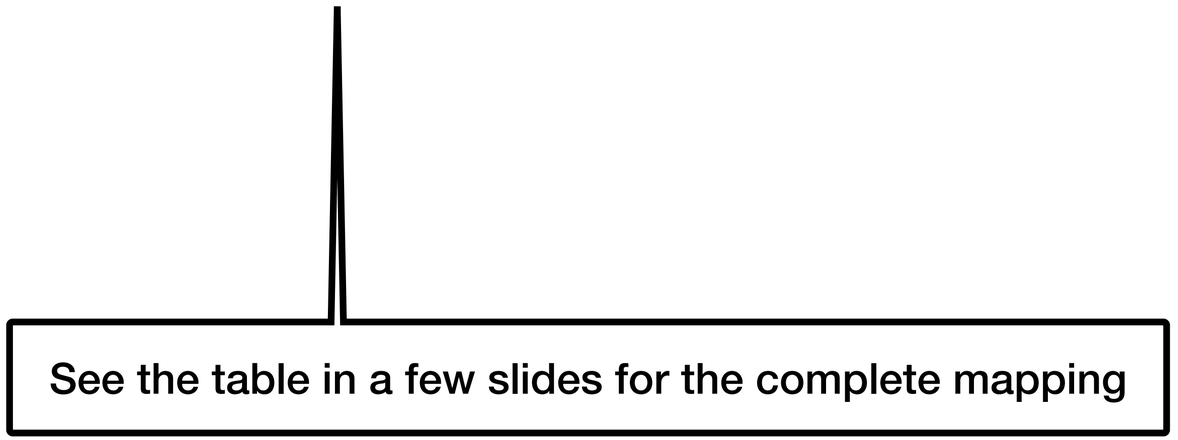
```
// simple query with results
ResultSet rs = session.execute(“SELECT * FROM users WHERE user_id=?”, 123);
```

ResultSet

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

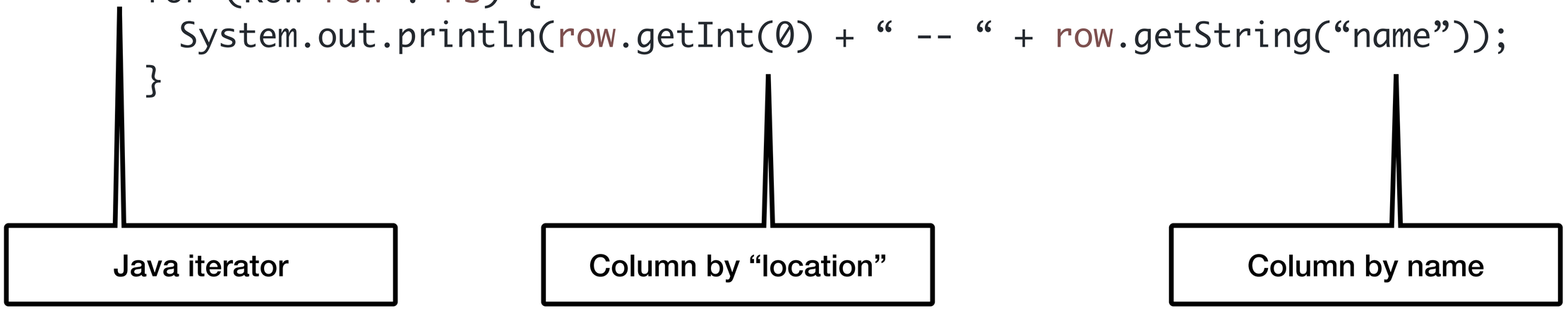
ResultSet - example (1)

```
// 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));
```



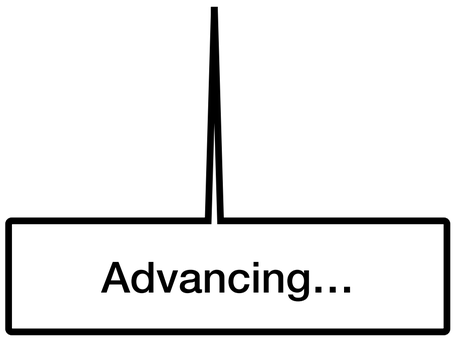
ResultSet - example (2)

```
// 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”));
}
```



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	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

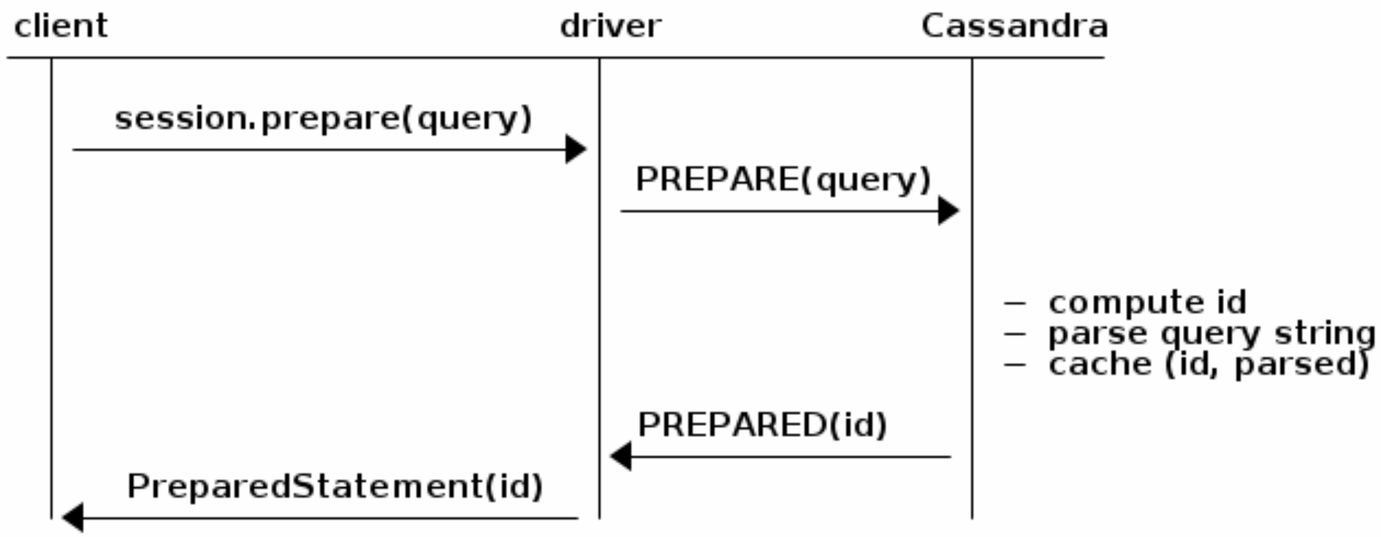
- More efficient than simple statements for queries that are used often

- Requires query to be “saved” on the servers

  thus - do not use with infrequent queries

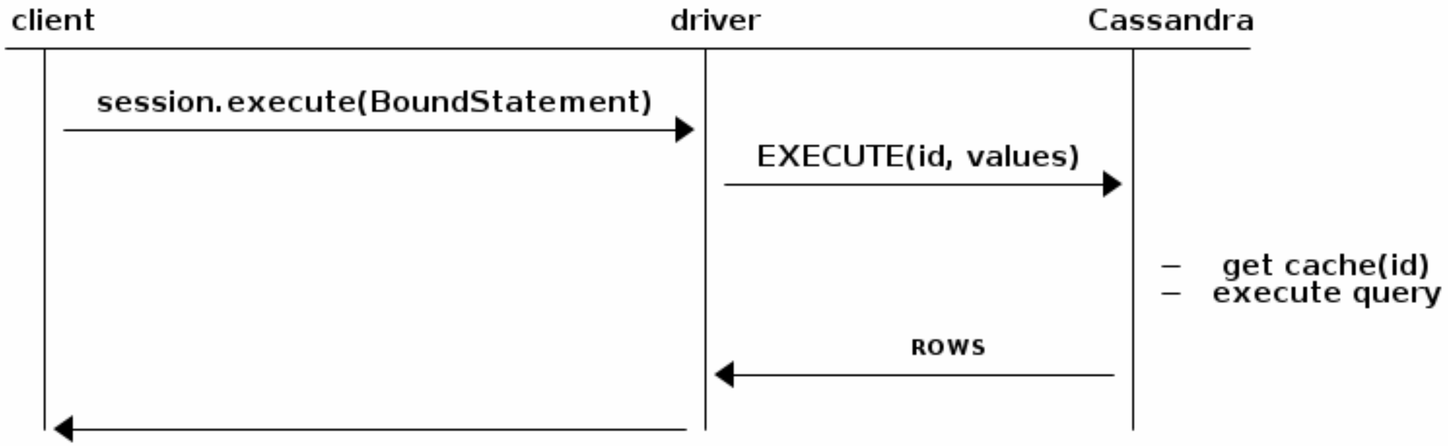
Prepared statements - logic (1)

- 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);
```

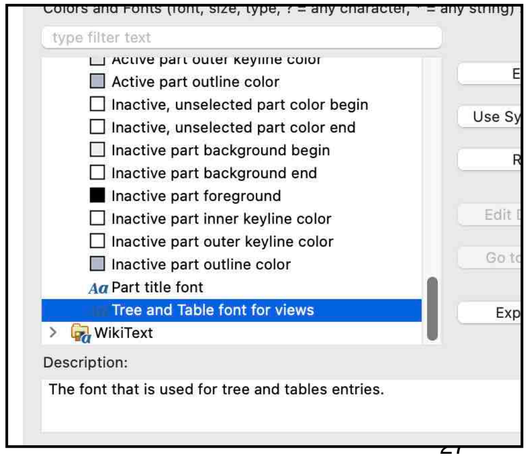
HW2

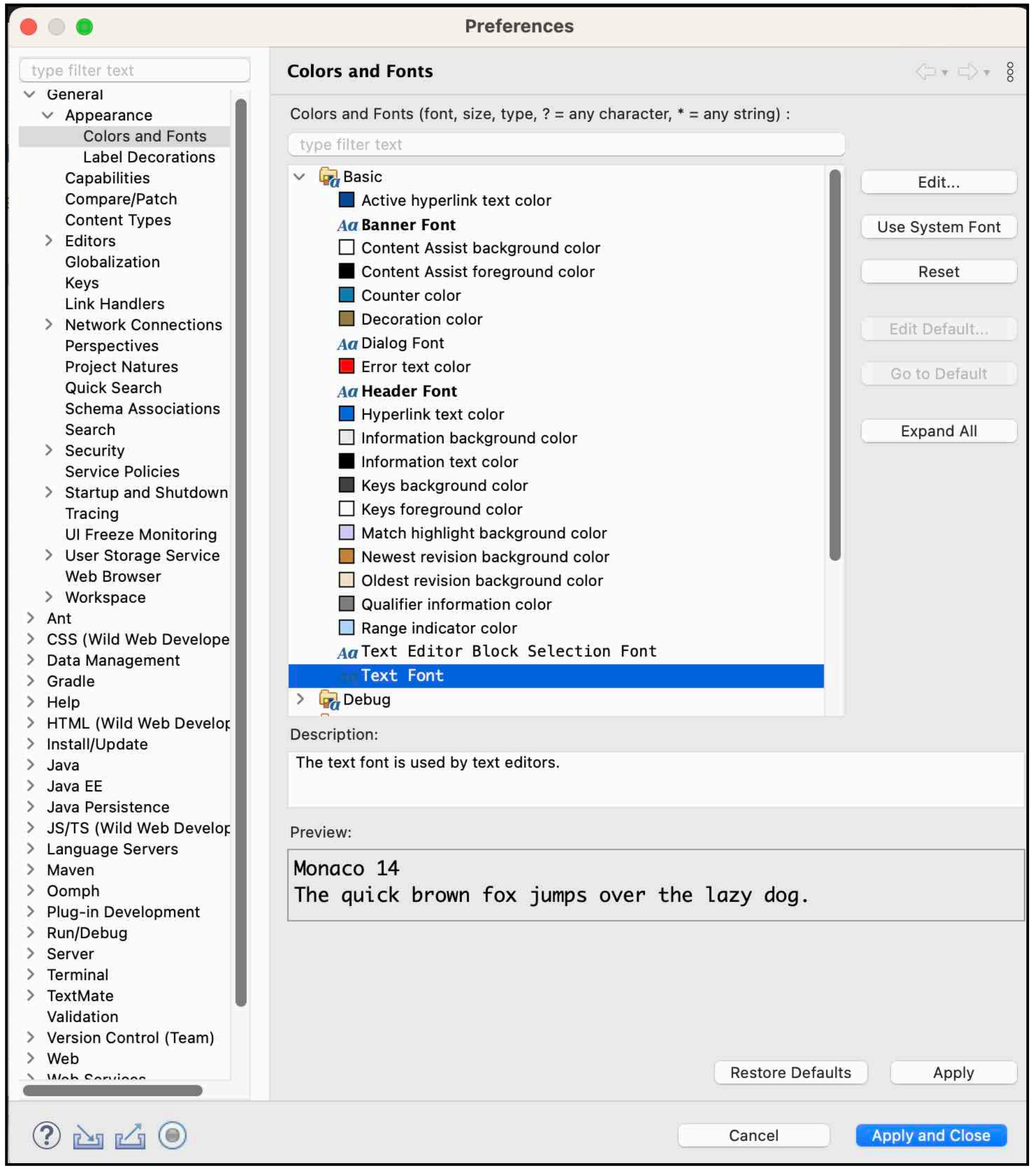
For HW2 - Checklist

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

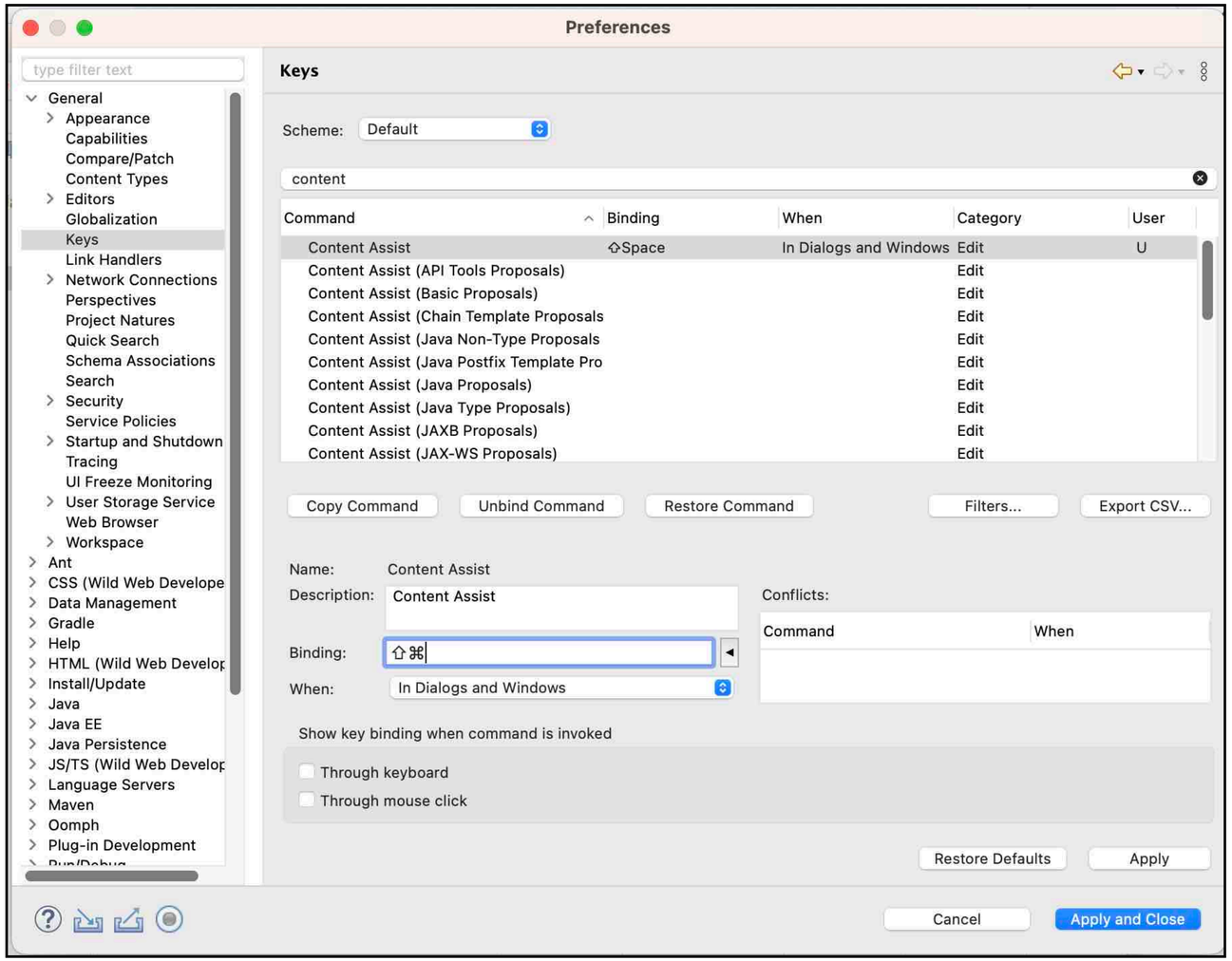


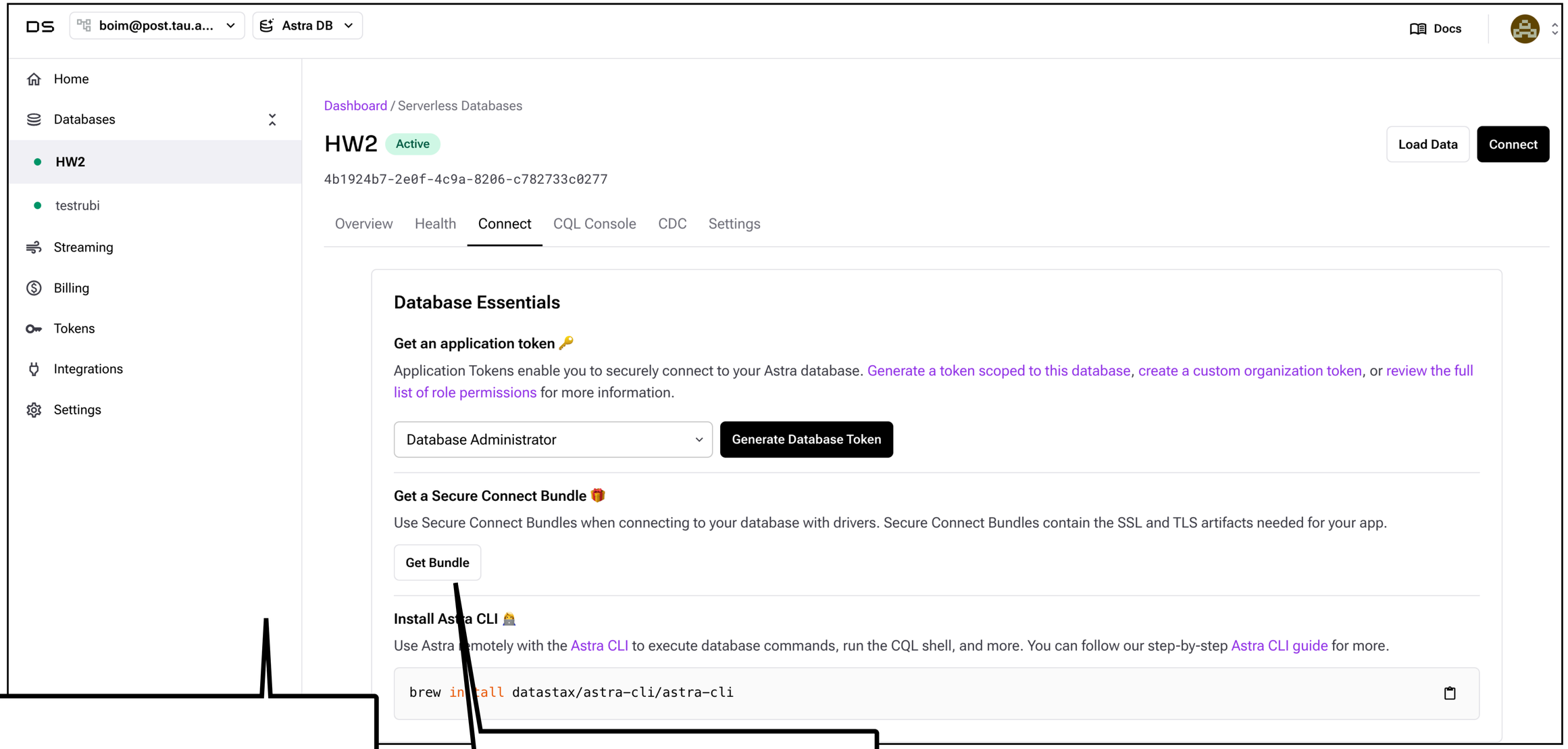


New workspace tips (2)

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

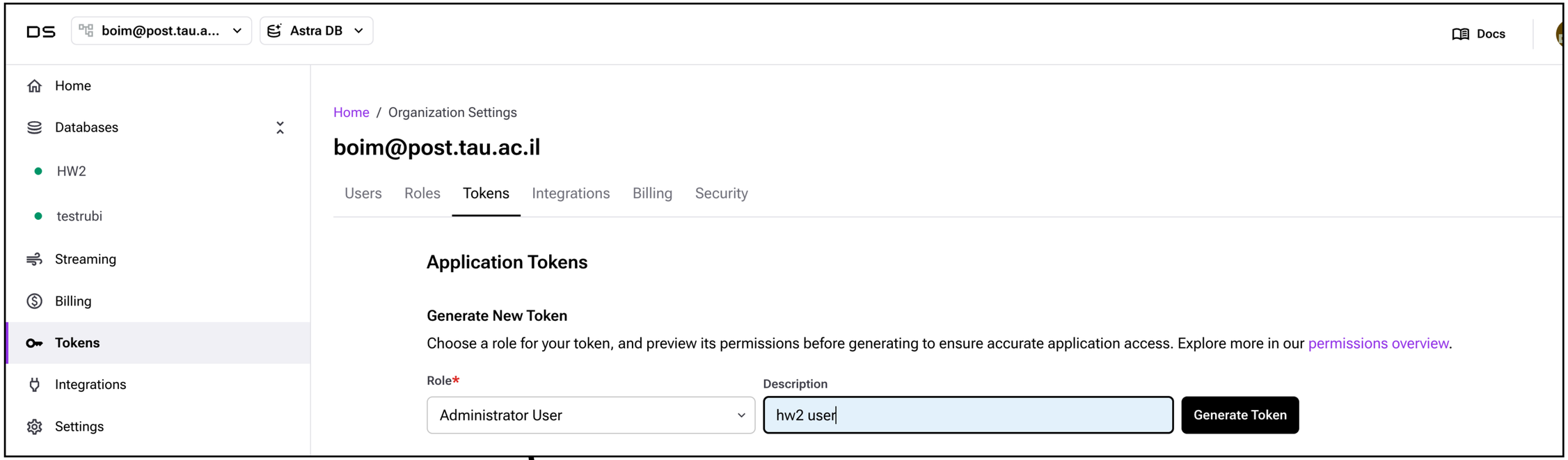
  Use Shift+Space





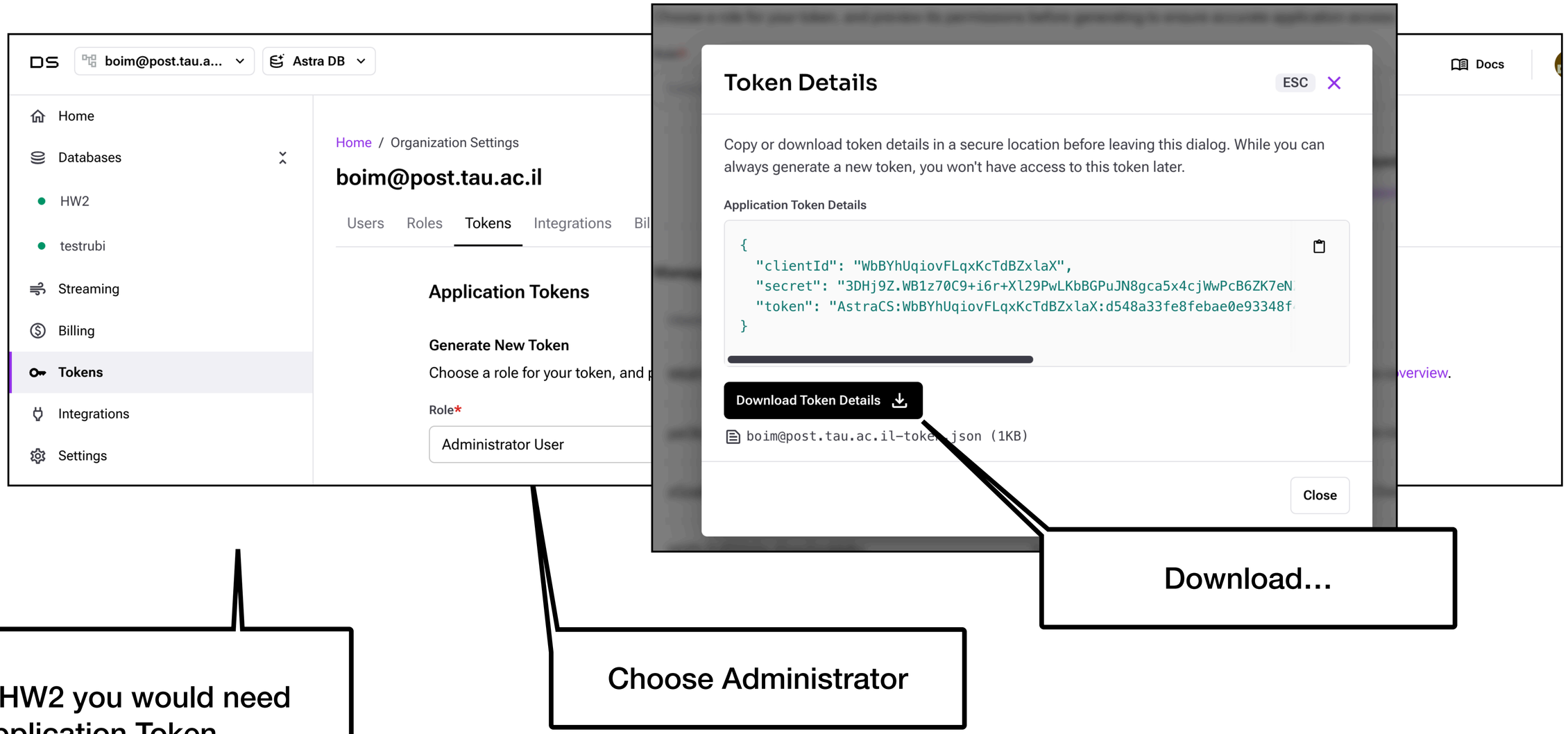
For HW2 you would need
- “Secure Connect Bundle”

Download



For HW2 you would need
- Application Token

Choose Administrator



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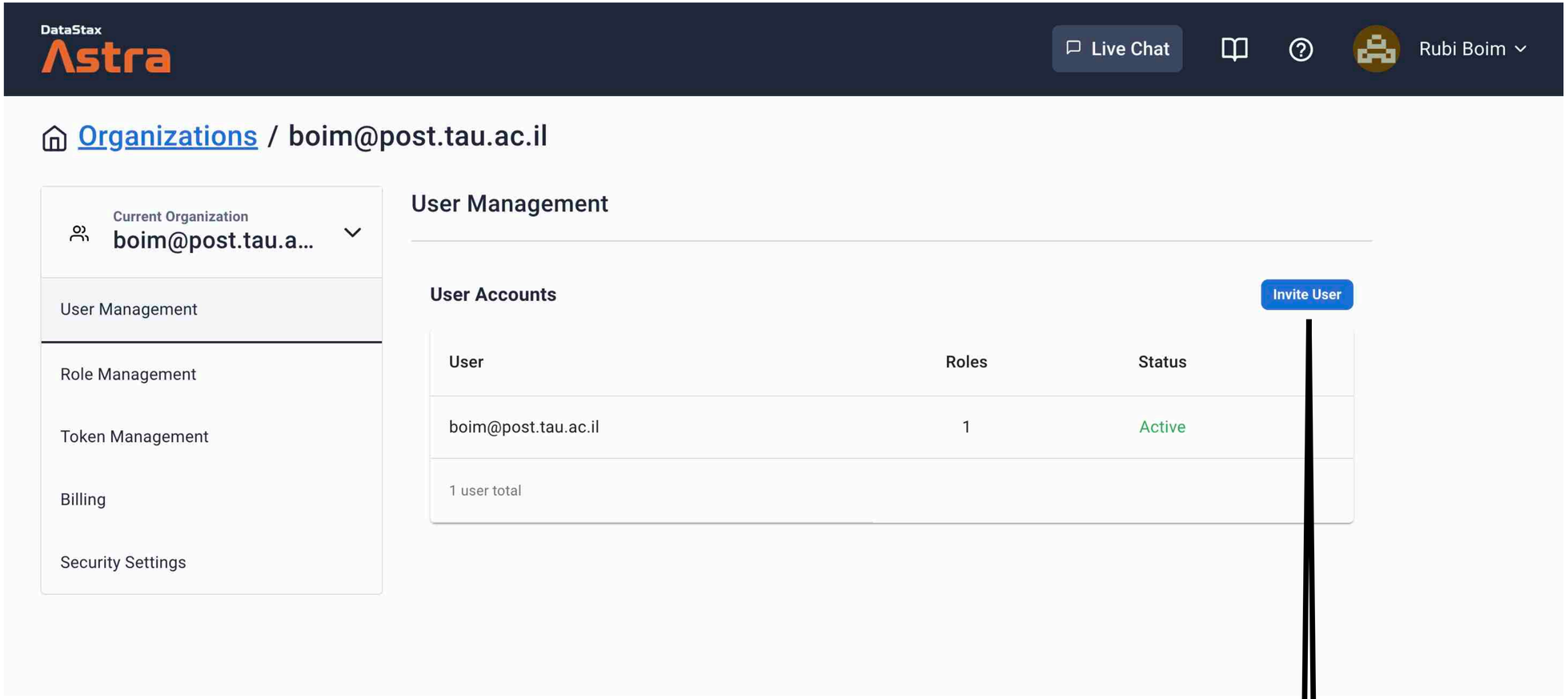
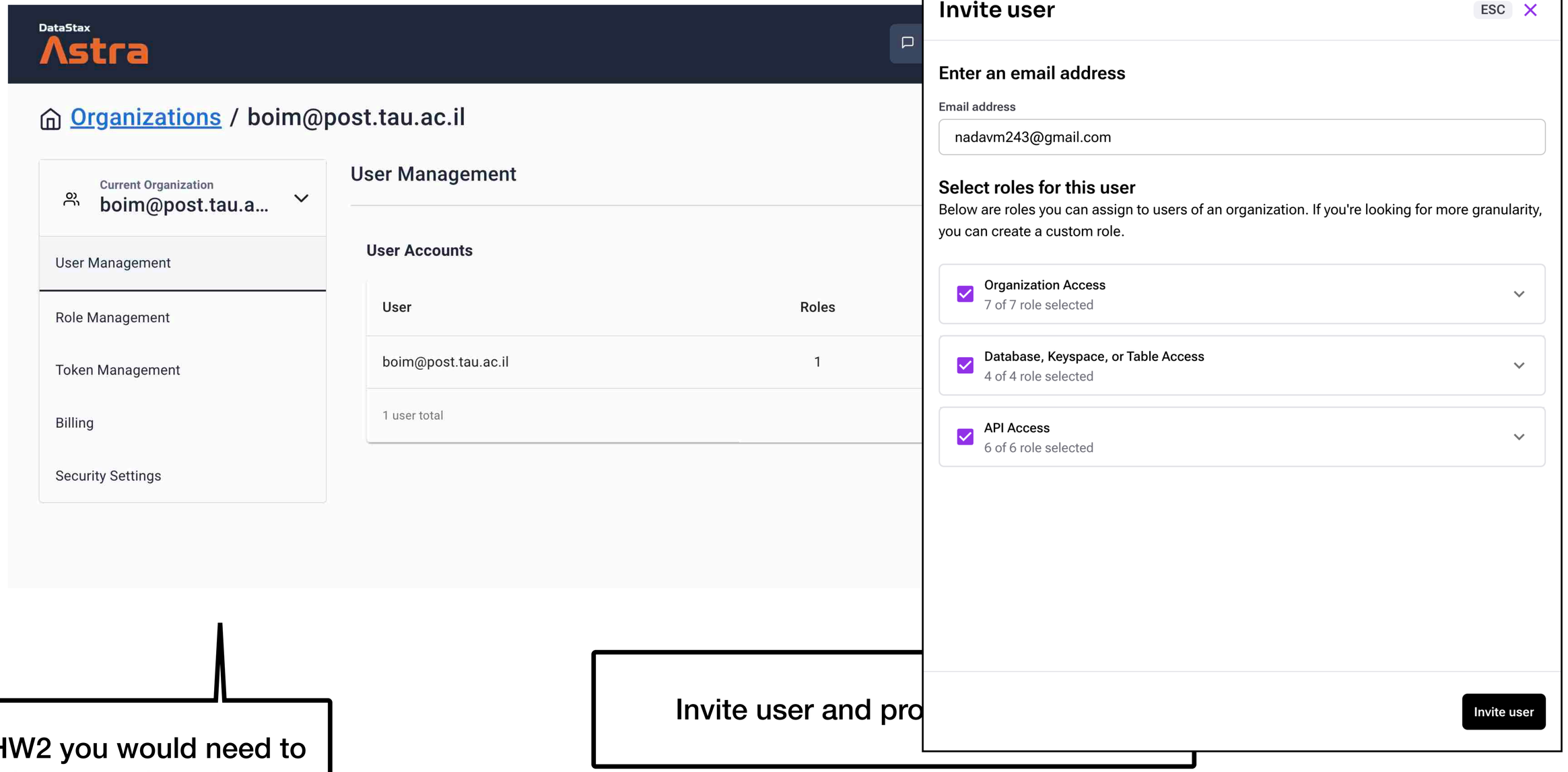
Download…



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

Invite user and provide *all* roles



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Invite user and pro