

JPA Performance Benchmark (JPAB)

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H2 Pure Java Database

JPA Providers

DataNucleus

EclipseLink

Hibernate

ObjectDB

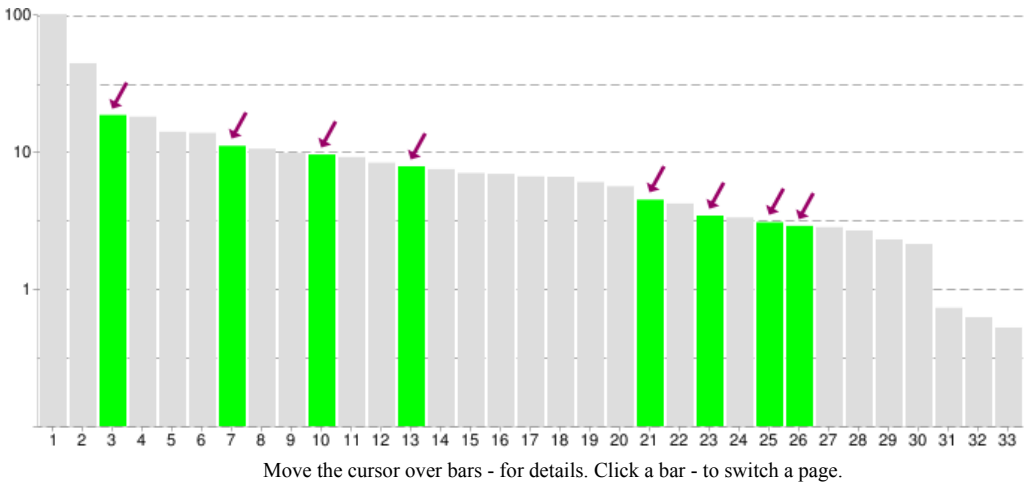
OpenJPA

H2 Performance Summary

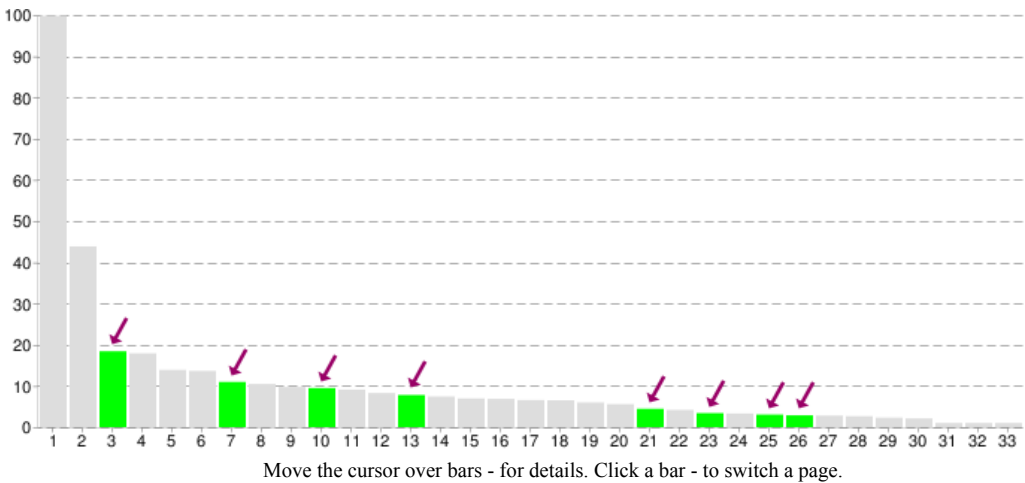
The following charts show the performance of H2 (in green) relatively to other JPA/DBMS combinations (in gray).

Position #1 on the X-Axis (the fastest) is about **100 times faster** than position #33 (the slowest).

In the chart below the Y-Axis represents result score (maximum 100) in **logarithmic scale** - higher is better:



In the chart below the Y-Axis represents result score (maximum 100) in **linear scale** - higher is better:



The configurations in which H2 has been tested are listed in the following table:

	Database + JPA Provider	Normalized Score 100 - Best, 0 - Worst	Final Position 1 - Best, 33 - Worst	Failed Tests
1	EclipseLink with H2 embedded	18.4	3 (out of 33)	0
2	Hibernate with H2 embedded	11.0	7 (out of 33)	0
3	OpenJPA with H2 embedded	9.5	10 (out of 33)	0
4	DataNucleus with H2 embedded	7.8	13 (out of 33)	4
5	EclipseLink with H2 server	4.5	21 (out of 33)	0

6	Hibernate with H2 server	3.4	23 (out of 33)	0
7	OpenJPA with H2 server	3.0	25 (out of 33)	0
8	DataNucleus with H2 server	2.9	26 (out of 33)	4

As shown above, the performance and stability are highly dependent on the JPA provider. H2 is faster and more stable (in both client-server and embedded modes) when used with EclipseLink or Hibernate.

About H2 Database

H2 Database is a popular pure Java RDBMS. Its first version was released in 2005.

H2 is available under a modified version of the Mozilla Public License (MPL) license or under the Eclipse Public License (EPL).

In this benchmark H2 version 1.3.164 (which was released in February 2012) has been tested.

Both client-server and embedded mode are supported by H2 and were tested in this benchmark.

Solved Problems and Issues

The stack traces below demonstrate some exceptions that have been thrown when using H2 database in previous runs of this benchmark and have been fixed by upgrading software and setting.

```
org.apache.openjpa.persistence.RollbackException: Unique index or primary key violation:
INSERT INTO OPENJPA_SEQUENCES_TABLE (ID, SEQUENCE_VALUE) VALUES (?, ?) [23001-141] {pre
    at org.apache.openjpa.persistence.EntityManagerImpl.commit(EntityManagerImpl.java:
    at org.jpab.Test.persist(Test.java:216)
    at org.jpab.Test.persist(Test.java:199)
```

```
org.apache.openjpa.persistence.ArgumentException: Failed to execute query "SELECT o FROM
    at org.apache.openjpa.kernel.QueryImpl.execute(QueryImpl.java:870)
    at org.apache.openjpa.kernel.QueryImpl.execute(QueryImpl.java:792)
    at org.apache.openjpa.kernel.DelegatingQuery.execute(DelegatingQuery.java:542)
    at org.apache.openjpa.persistence.QueryImpl.execute(QueryImpl.java:288)
```

```
javax.persistence.RollbackException: Exception [EclipseLink-4002] (Eclipse Persistence S
Internal Exception: org.h2.jdbc.JdbcBatchUpdateException: Referential integrity constrai
DELETE FROM NODE WHERE (ID = ?) [23003-147]
Error Code: 23003
    at org.eclipse.persistence.internal.jpa.transaction.EntityTransactionImpl.commit
```