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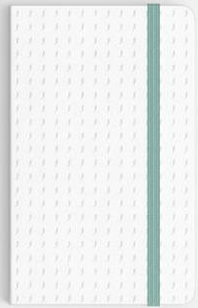

Live migration of cantamen's primary database cluster

From MySQL 5.7 to MariaDB 10.11 in under 10 minutes

Dirk Hillbrecht,
cantamen co-founder, system architect and initial developer

Who we are & what we do

cantamen

- cantamen GmbH: Germany’s largest independent provider for car-sharing software and system solutions
  - Management software “EBuS” (since 1997)
  - Call-center for fleet users (since 2009)
  - In-vehicle hardware “Share Wizard” (since 2016)
- Founded in 2003, started with 3 people, now ~90 empolyees
- Today:
  - ~60 car-sharing providers
  - ~10.000 vehicles
  - ~120.000 users/customers

Our application

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- “EBuS” - “Elektronisches Buchungssystem” (“electronic booking system)
- Server written completely in Java (currently Java 17)
- Database access via Hikari connection pool
- ~80% hand-written SQL statements directly on JDBC
- ~20% JPA using Eclipselink
- Currently
  - One server serves everything
  - Some inflexibility regarding the database connection
    → *Shutdown during database update inevitable*

Our database

- MySQL 5.7 (after starting form 3.22 back in 1997)
- Primary master-slave cluster with three members
- Secondary slave attached to the cluster
- Ternary slaves attached to the secondary slave
- Homogenous replication: Everyone has the same data
- Master serves around 1.2*10^9 queries per day (1.2 millards/billions)

The migration

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- MySQL 5.7 out of support since August 2023
- Out of all modern Linux distributions
- MariaDB impressed in side projects, esp. regarding updates
- Migration must happen without long production stop
- Everything is to be migrated

- *Known procedure:* MariaDB replicates from MySQL
- *Unknown procedure:* MySQL replicates from MariaDB

Stick with known procedures

The original setup

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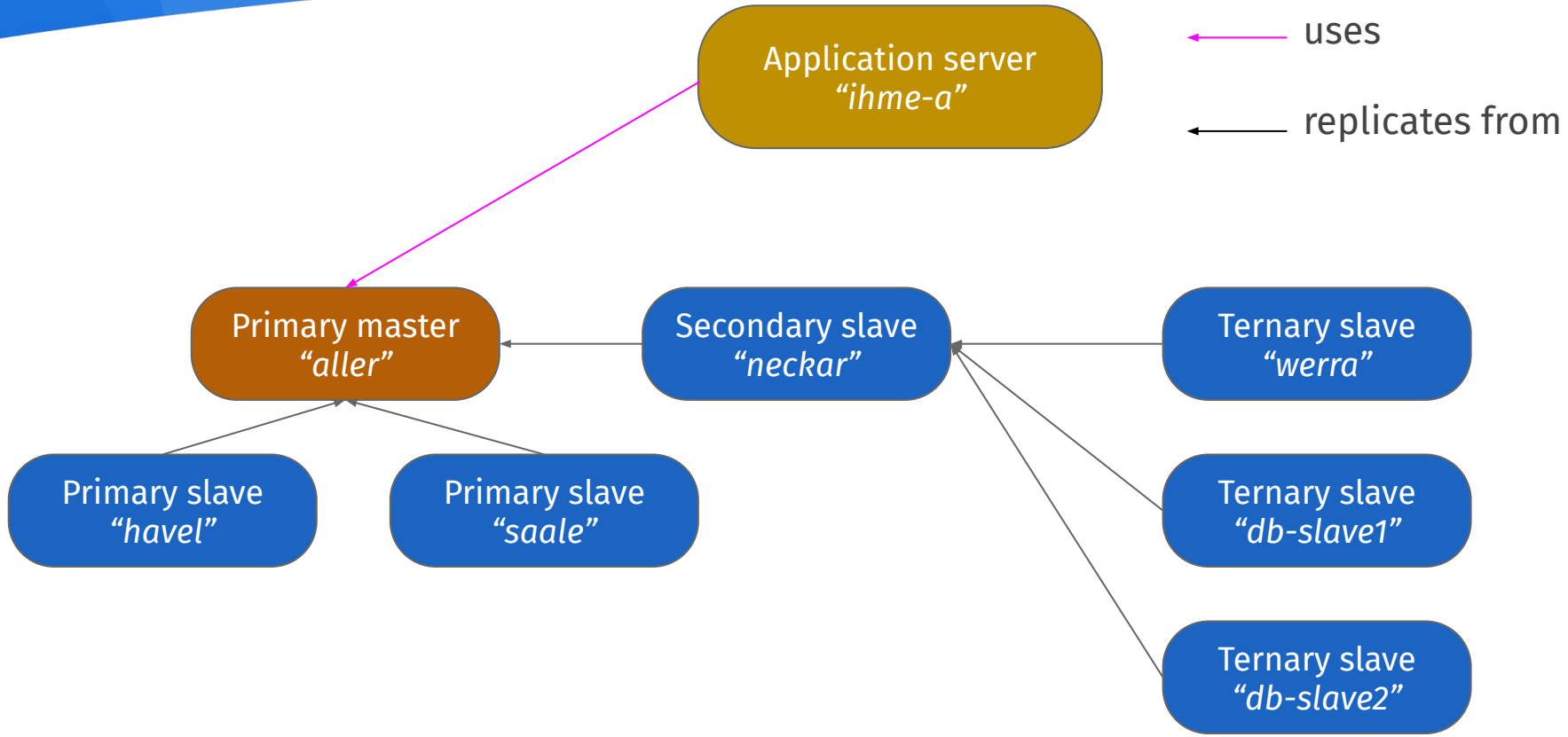

Database server system

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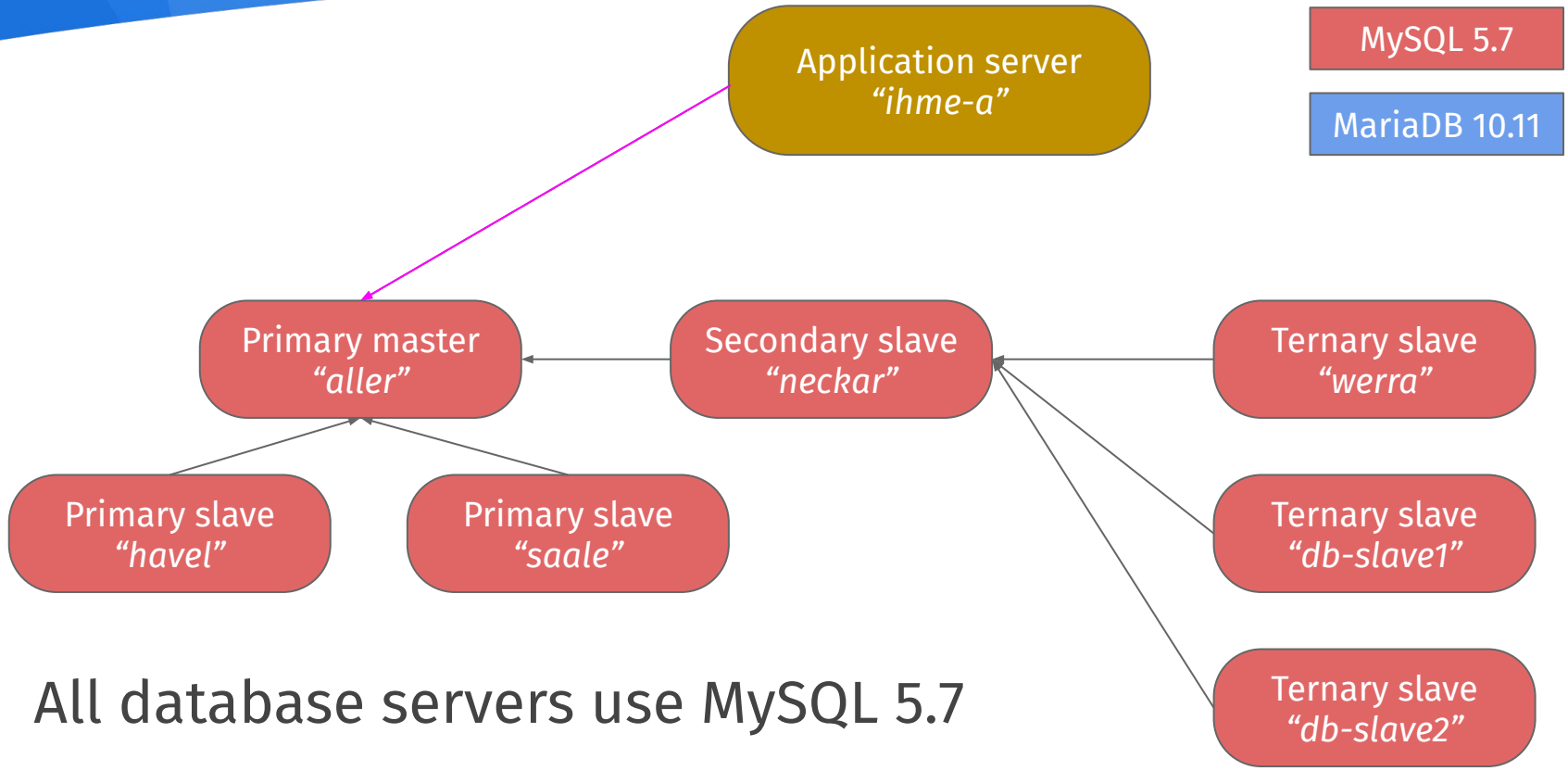

All database servers use MySQL 5.7

Adding a new slave

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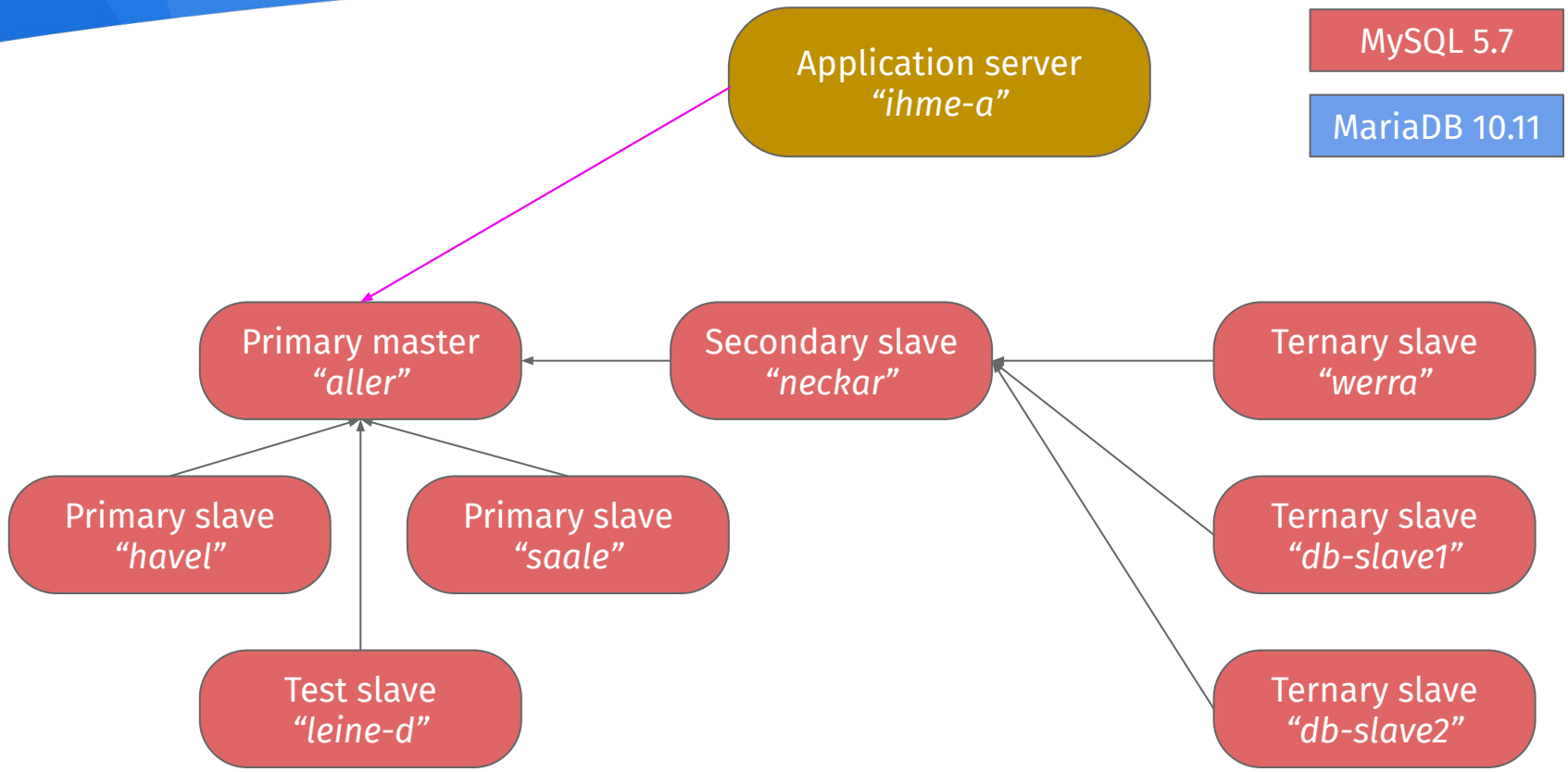

Converting the test slave to MariaDB

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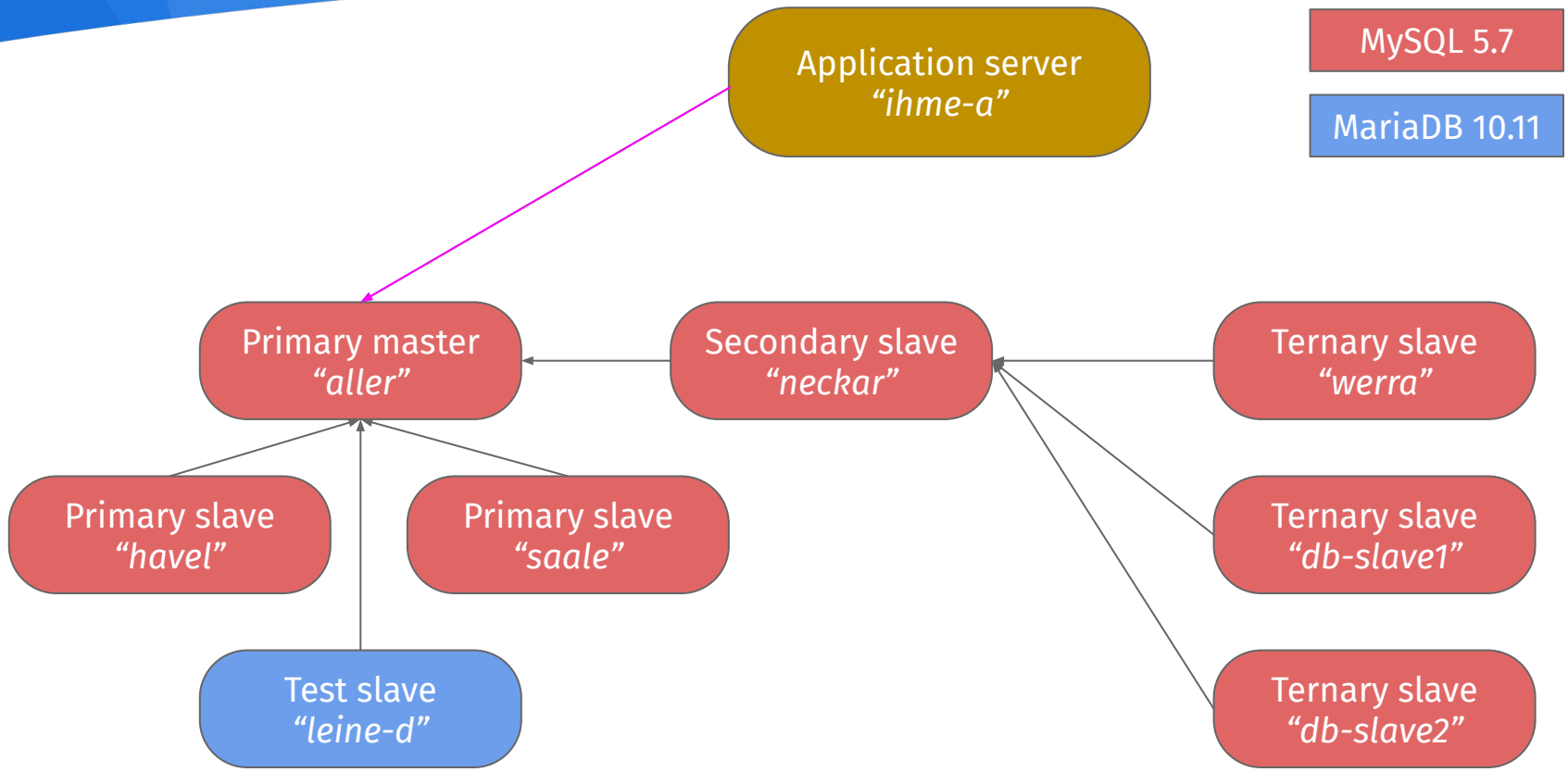

Converting the ternary slaves

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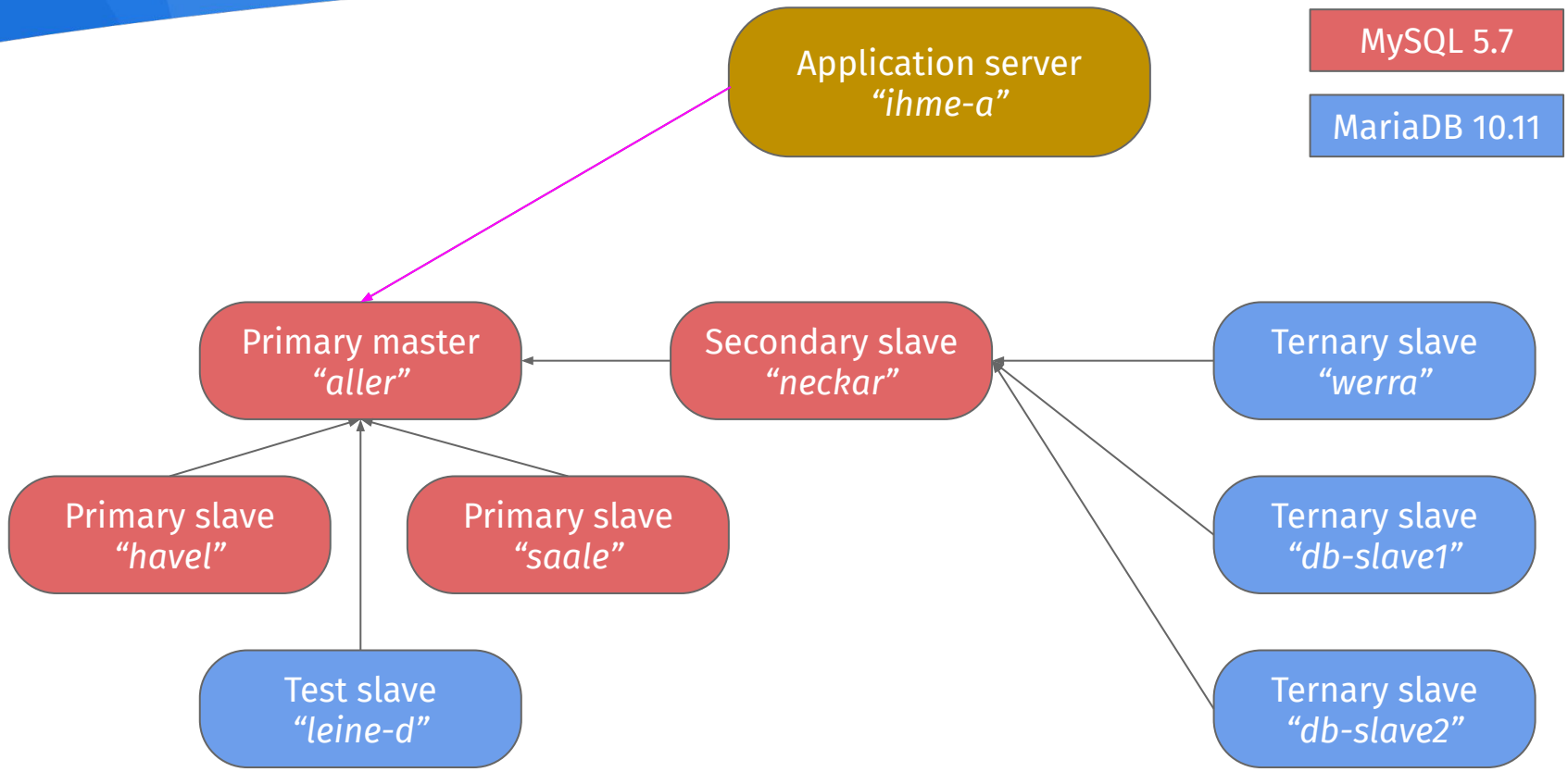

Converting the secondary slave

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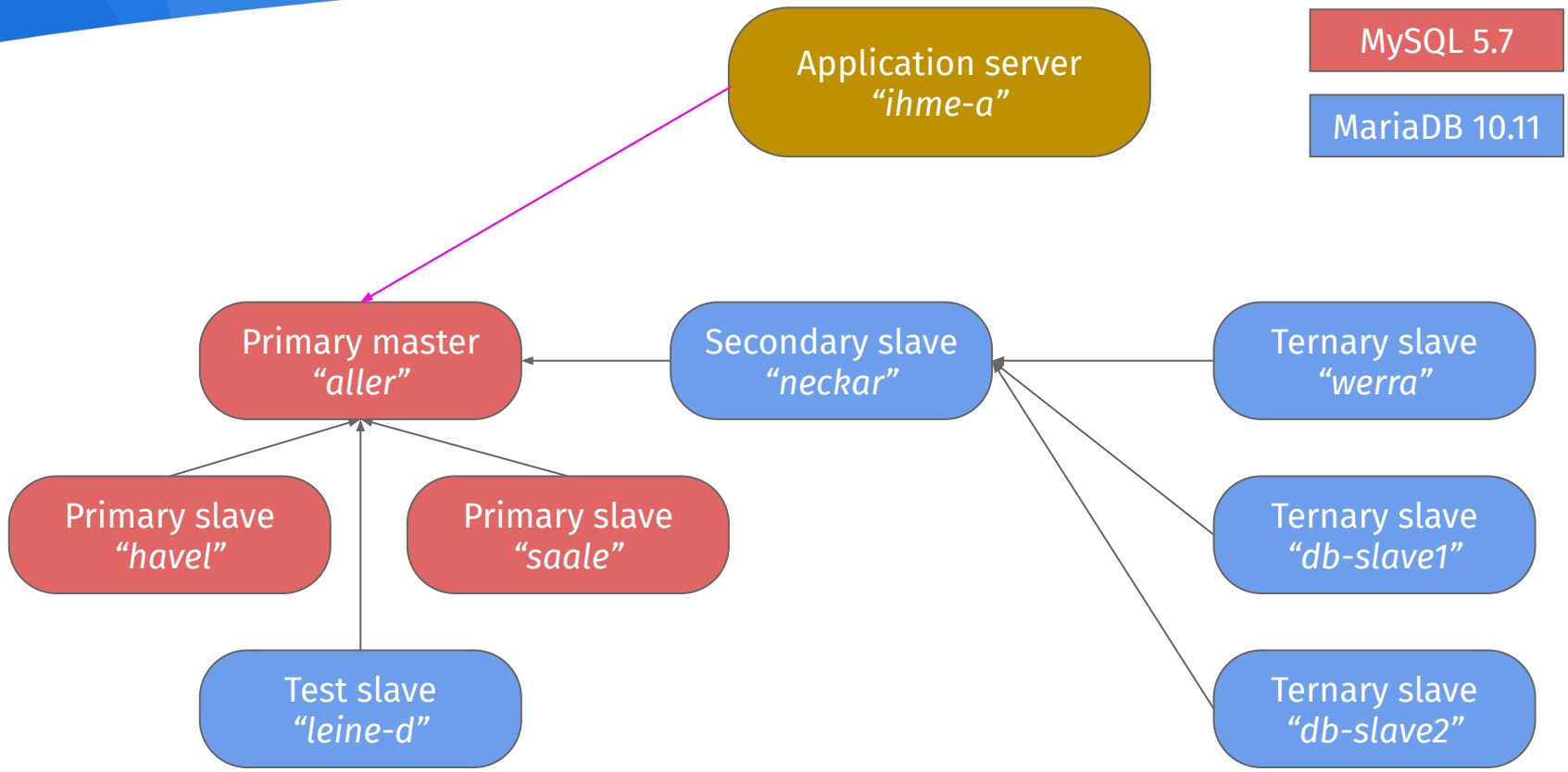

Converting the primary slaves

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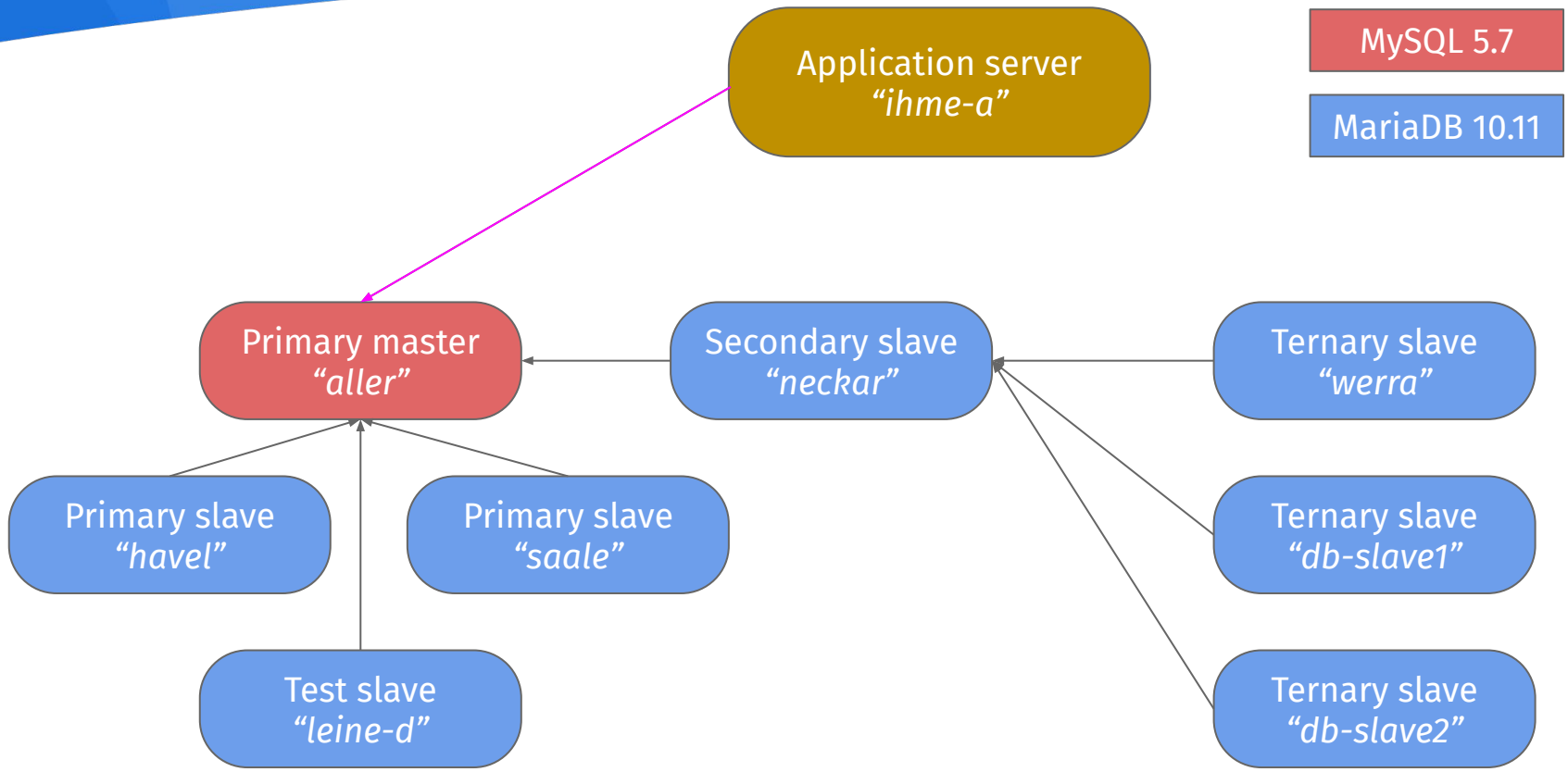

Prepare future master node

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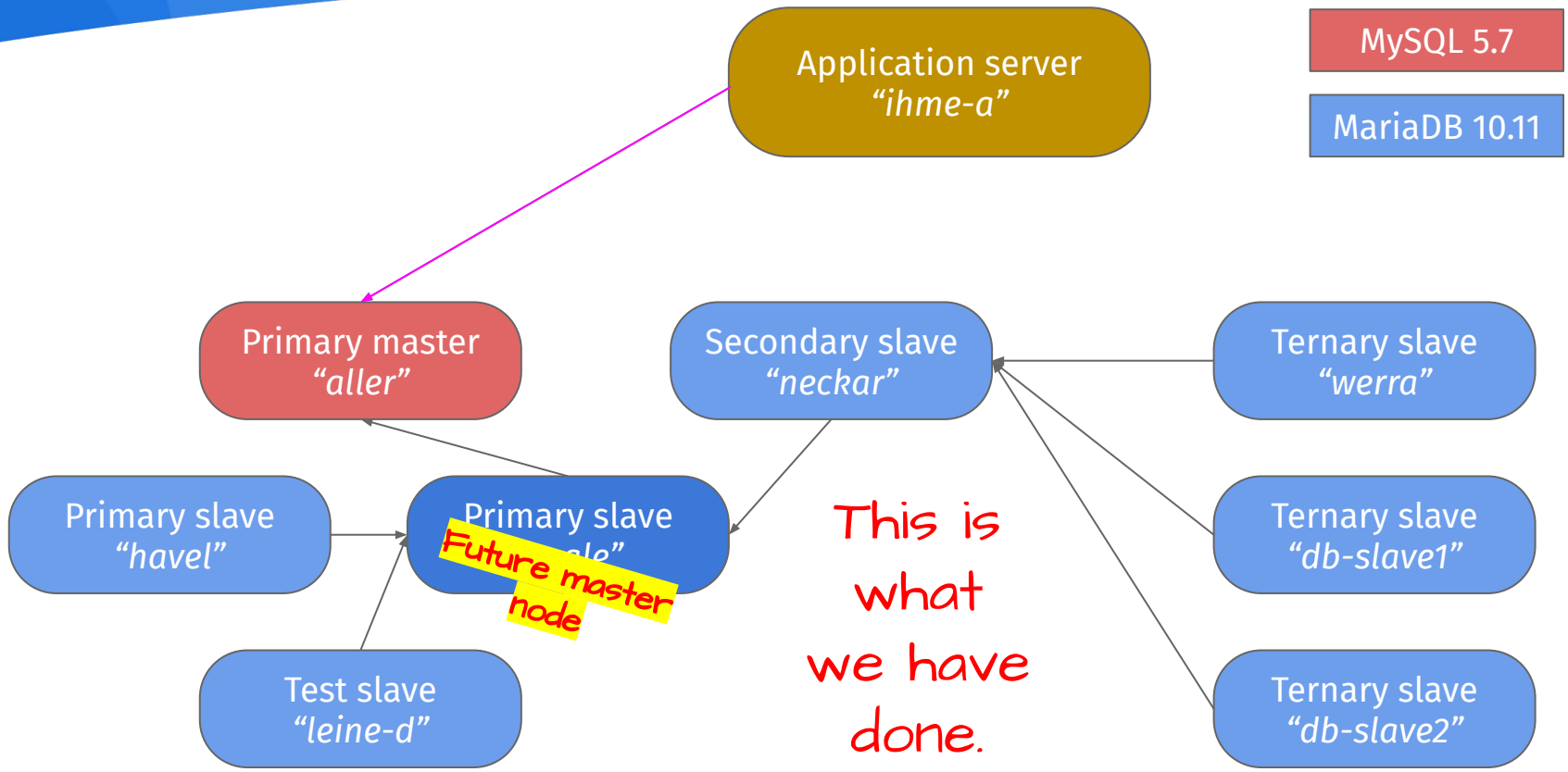

Switch over master node

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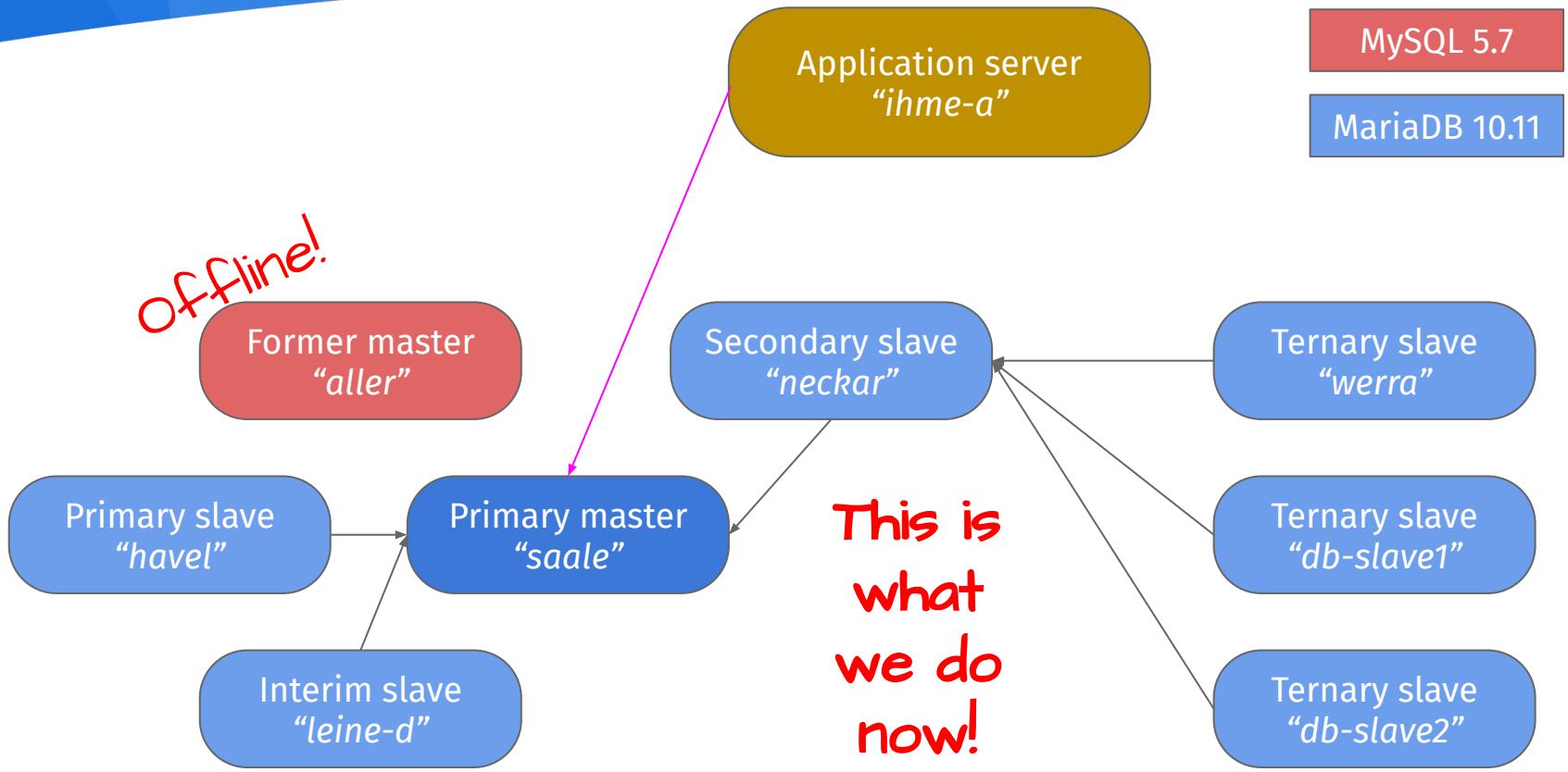

Convert old master to slave (and MariaDB)

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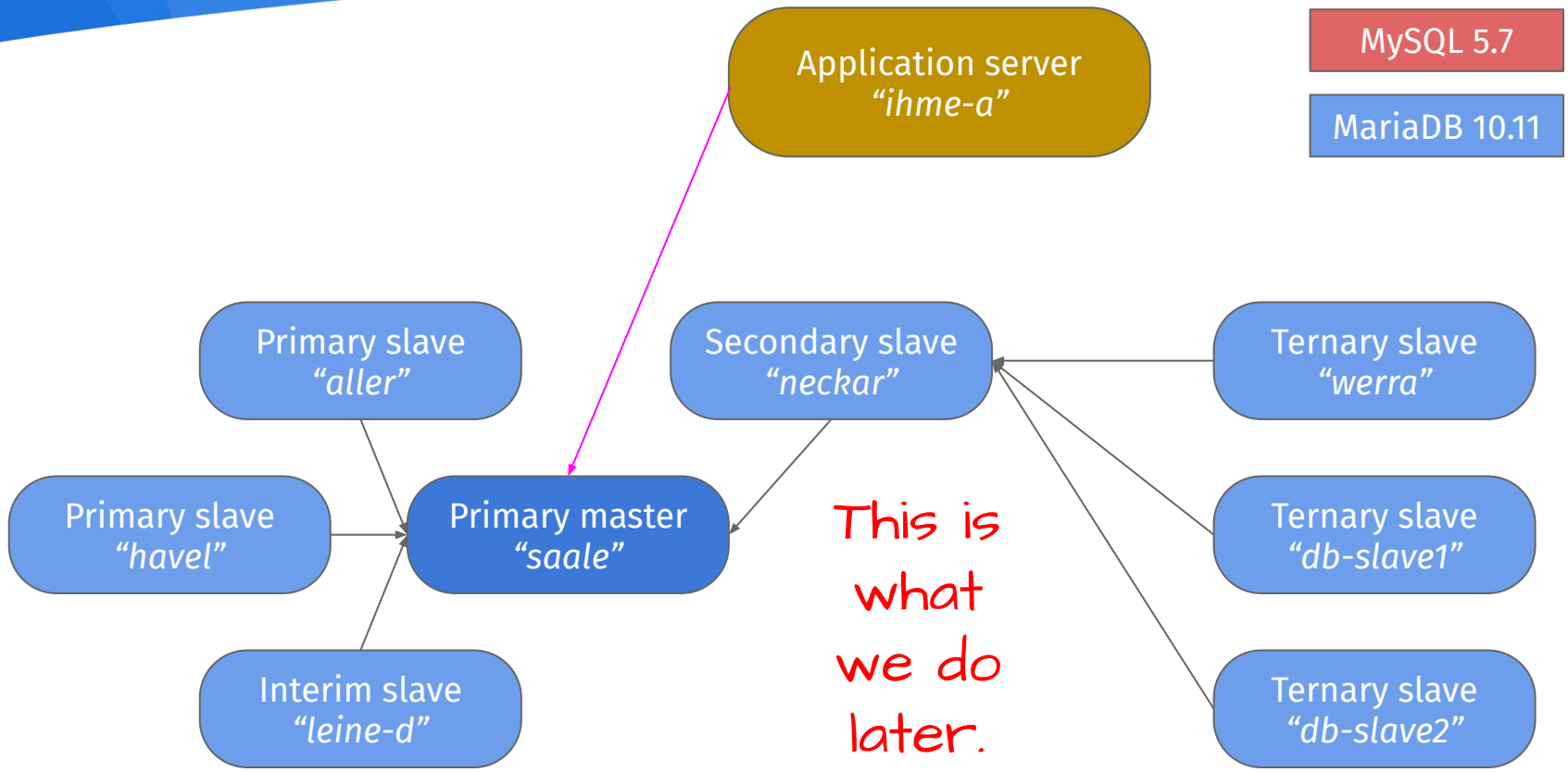

How do we do it

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- Shut down application
- Shut down former primary master
- Change “`dbmaster`” alias in DNS and `/etc/hosts`
- Restart application

Note 1: No database shutdown or restart, no configuration change in database or application.
Note 2: Application shutdown due to restriction in application’s framework, not strictly needed by MariaDB or MySQL.

Enough of all that theory...

Time for action!

Conversion of one node to MariaDB

- Stop replication: `STOP SLAVE io_thread`, wait, `STOP SLAVE`
- Note replication coordinates (`RELAY_MASTER_LOG_FILE`, `EXEC_MASTER_LOG_POS`)
- Stop MySQL, start MariaDB in the same data
- Run mariadb-upgrade
- In theory: `START SLAVE` and it continues
- In practice: `RESET SLAVE`, `CHANGE MASTER TO`, `START SLAVE`
- Some weirdness in the binary/relay logs

How did we know it will work?

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- Convert development system to MariaDB, develop against it
- Convert integration test servers to MariaDB, run test suite
- Add MariaDB production node, replicate all write operations
- Migrate internal manual test systems for special purposes
- Migrate preview server systems, run manual operations on larger scale
- Throw large chunks of real-world-read operations to servers

Did we have a desaster recovery strategy?

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- Switch back to MySQL after migration? Difficult due to replication direction.
- Only possible scenario: Unforeseen performance issues
- If needed: Go to unknown procedure:
  - Attach MySQL-running aller to MariaDB-running master saale
  - Let it catch up
  - Stop application & move it back to saale
  - Make aller again master to saale
  - Fix the issue & try again.