Stealthy migrating MySQL tables and MySQL data access interfaces using enlarged updateable VIEW functionality

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Applications occasionally require redesign. However, redesigning an application cannot be done in one step because the application is distributed or several versions of applications must be supported.

MySQL 5.0 provides the necessary means to stealthy migrate your data.

In a short overview let's look at what we plan to do:

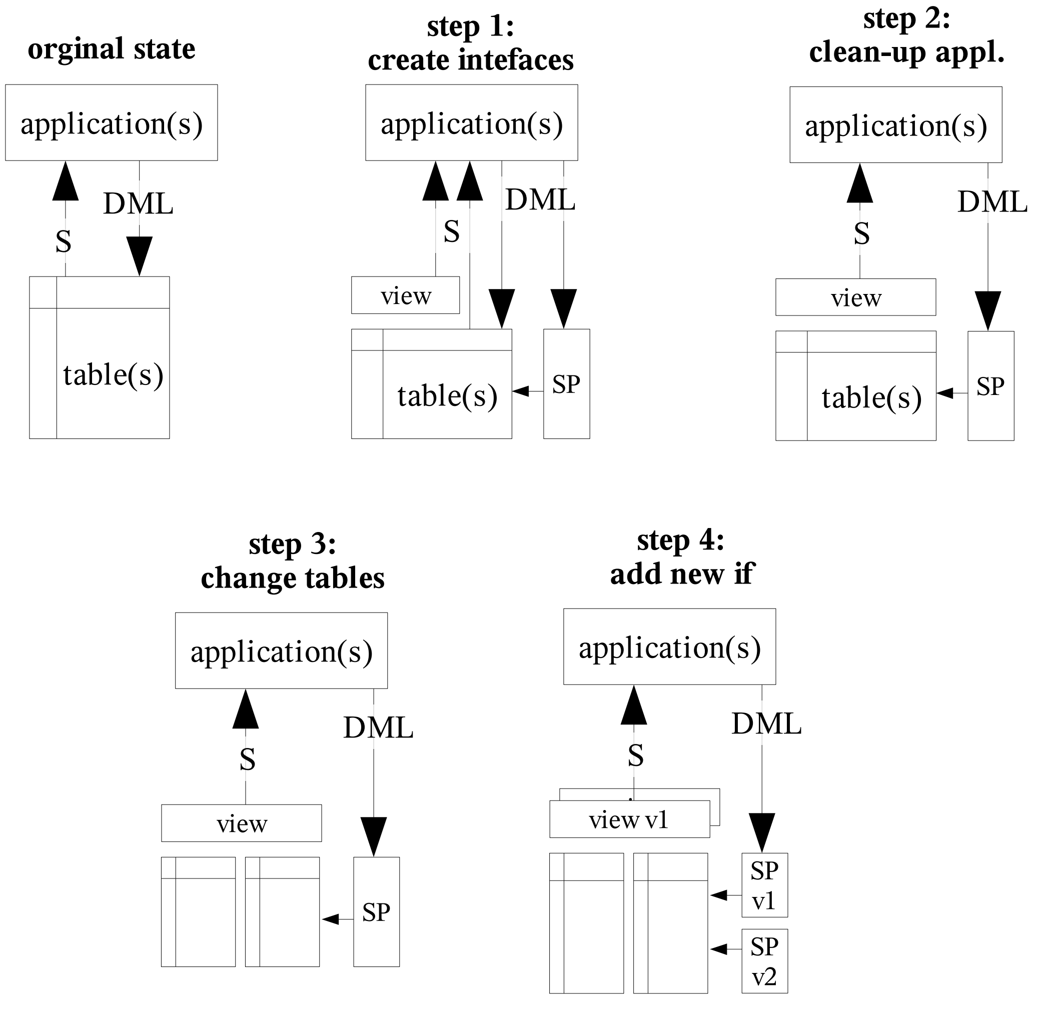
Original state: We have a typical application accessing the data via SELECT and DML (INSERT, REPLACE, UPDATE, DELETE) commands. Because the table structure has to change in the near future we have to hide this against the application.

Step 1, create interfaces: To hide the table structure we cover it with a layer of VIEW's and Stored Procedures (SP). The Application can still access the data via the original paths. New applications can access the new interfaces.

Step 2, clean-up of application: When the interfaces are properly defined and implemented, the application can be migrated step by step to the new interfaces.

Step 3, Change table structure: When all the tables are covered by the new interfaces, the table structure can be changed and interface versions can be upgraded to the new table structure in one step.

Step 4, Add new interface versions: From now on, new interface versions can be added to provide new features, table structures can be changed, and support for older application versions can be better guaranteed.



Step by step

Let's first simulate the original state:

```
CREATE TABLE company_employee
(
    id       INT UNSIGNED NOT NULL AUTO_INCREMENT PRIMARY KEY
  , company  VARCHAR(128) NOT NULL
  , employee VARCHAR(128) NOT NULL
)
;

INSERT INTO company_employee
VALUES (1, 'MySQL', 'Hans Meier')
     , (2, 'MySQL', 'Hugo Huber')
     , (3, 'Tante Emma Laden', 'Hanne Hitz')
     , (4, 'Gegenueber Shop', 'Fritz Froehlich')
;
```

Our application consists of the following operations:

```
SELECT *
  FROM company_employee
;

INSERT INTO company_employee
VALUES (NULL, 'Linux', 'Anton Albern')
;

UPDATE company_employee
   SET employee = 'Berta Bach'
 WHERE id = 5
;

DELETE
  FROM company_employee
 WHERE id = 5
;
```

Everything is fine now. We can access our data and we can modify it. But, ... hmm, ok the data model behind this example is not that perfect. We sometimes read about normalization and 3rd normal form. So the goal is to stealthy migrate this table in 3rd normal form.

Create the interfaces

To hide this change, we have to first create some interfaces:

```
CREATE VIEW ce_select_if_v1 AS
SELECT id, company, employee
  FROM company_employee
;

DELIMITER //

CREATE PROCEDURE ce_insert_if_v1
(
    IN  company_name  VARCHAR(128)
  , IN  employee_name VARCHAR(128)
)
BEGIN

  INSERT INTO company_employee
  VALUES (NULL, company_name, employee_name)
  ;
END;
//

CREATE PROCEDURE ce_update_if_v1
(
    IN  company_id    INT
  , IN  employee_name VARCHAR(128)
)
BEGIN

  UPDATE company_employee
     SET employee = employee_name
   WHERE id = company_id
  ;
END;
//

CREATE PROCEDURE ce_delete_if_v1
(
    IN  company_id    INT
)
BEGIN

  DELETE
    FROM company_employee
   WHERE id = company_id
  ;
END;
//

DELIMITER ;
```

Now the old operations, as well as the following new ones should still work:

```
SELECT *
  FROM ce_select_if_v1
;

CALL ce_insert_if_v1('Linux', 'Anton Albern');

CALL ce_update_if_v1(6, 'Berta Bach');
CALL ce_delete_if_v1(6);
```

Clean-up application

Clean-up of the application code cannot be shown here. There are several ways to ensure that the data is being accessed solely using the provided interfaces:

- You can revoke the privileges for a certain user to directly access the data and grant these privileges only to the stored procedures or
- You can create some triggers on these tables which are logging some informations about the user, time, etc. or
- You can parse the general query log for suspicious queries or
- You can rename the underlying tables and the queries will fail and the client will get an error message.

Change table

Now the table can be changed:

```
CREATE TABLE company
(
    id           INT UNSIGNED NOT NULL AUTO_INCREMENT PRIMARY KEY
  , company_name VARCHAR(128) NOT NULL
)
;

CREATE TABLE employee
(
    id         INT UNSIGNED NOT NULL AUTO_INCREMENT PRIMARY KEY
  , first_name VARCHAR(128) NOT NULL
  , last_name  VARCHAR(128) NOT NULL
  , company_id INT NOT NULL
)
;

INSERT INTO company
SELECT id, company
  FROM company_employee
;

# Not perfect but for demo it is enough.
INSERT INTO employee
  SELECT NULL, SUBSTRING(employee, 1, locate(' ', employee)-1)
       , SUBSTRING(employee, locate(' ', employee)+1), id
    FROM company_employee
;
```

And the interfaces have to be adapted too:

```
RENAME TABLE ce_select_if_v1 TO ce_selct_if_v1_old;

CREATE VIEW ce_select_if_v1 AS
SELECT company.id, company_name AS 'company'
     , CONCAT(first_name, ' ', last_name) AS 'employee'
  FROM company INNER JOIN employee ON company.id = employee.company_id
;

DELIMITER //

DROP PROCEDURE ce_insert_if_v1 //

CREATE PROCEDURE ce_insert_if_v1
(
    IN  company_name  VARCHAR(128)
  , IN  employee_name VARCHAR(128)
)
BEGIN

  DECLARE id INT;

  INSERT INTO company
  VALUES (NULL, company_name)
  ;

  SET id = LAST_INSERT_ID();

  INSERT INTO employee
  VALUES (NULL, SUBSTRING(employee_name, 1, locate(' ', employee_name)-1)
       , SUBSTRING(employee_name, locate(' ', employee_name)+1), id)
  ;
END;
//

DROP PROCEDURE ce_update_if_v1 //

CREATE PROCEDURE ce_update_if_v1
(
    IN  id    INT
  , IN  employee_name VARCHAR(128)
)
BEGIN

  UPDATE employee
     SET first_name = SUBSTRING(employee_name, 1, locate(' ', employee_name)-
1)
       , last_name = SUBSTRING(employee_name, locate(' ', employee_name)+1)
   WHERE company_id = id
  ;
END;
//

DROP PROCEDURE ce_delete_if_v1 //

CREATE PROCEDURE ce_delete_if_v1
(
    IN  id    INT
)
BEGIN

  DELETE
    FROM employee
   WHERE company_id = id
  ;
END;
//

DELIMITER ;
```

Now the operations should still work using the new interfaces and table structures:

```
SELECT *
  FROM ce_select_if_v1
;

CALL ce_insert_if_v1('Linux', 'Anton Albern');

CALL ce_update_if_v1(5, 'Berta Bach');

CALL ce_delete_if_v1(5);
```

New interfaces

Now, new interfaces can be built for future development.

Discussion

During the migration there was no cleanup in company table. So the table still contains redundant information which needs to be cleaned-up:

```
mysql> select * from company;
+----+-------------------+
| id | company_name      |
+----+-------------------+
|  1 | MySQL             |
|  2 | MySQL             |
...
+----+-------------------+
```

The interfaces do not yet provide full functionality to properly maintain the data. It needs to be defined if record #5 should have been deleted or not:

```
mysql> select * from company;
+----+-------------------+
| id | company_name      |
+----+-------------------+
|  1 | MySQL             |
...
|  5 | Linux             |
+----+-------------------+
```

Updateable views

MySQL 5.0 provides updateable views but with some restrictions. With the shown stored procedure wrappers we can reduce the number of restrictions.

On this VIEW we can update. It is an updateable view:

```
CREATE VIEW ce_select_if_v1 AS
SELECT id, company, employee
  FROM company_employee
;
```

But on a VIEW with an underlying JOIN you will receive the following errors:

```
INSERT INTO ce_select_if_v1 (id, company, employee)
VALUES (1, 'MySQL', 'Hans Meier')
;

ERROR 1393 (HY000): Can not modify more than one base table through a join
view 'test.ce_select_if_v1 '

UPDATE ce_select_if_v1
   SET employee = 'Hilde Fischer'
 WHERE id = 3
;

ERROR 1348 (HY000): Column 'employee' is not updatable

DELETE
  FROM ce_select_if_v1
 WHERE id = 1
;

ERROR 1395 (HY000): Can not delete from join view 'test.ce_select_if_v1 '
```

This is one of the reasons why stored procedures were used for this example. The solution using Stored Procedures provides much more flexibility for implementing logic about how the interface should behave.