Firebird 3: implementing safe authorization infrastructure

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Firebird Foundation
IbPhoenix

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Firebird 3: implementing safe authorization infrastructure

- Main authorization-related features:
  - Multiple security databases
  - Authorization plugins

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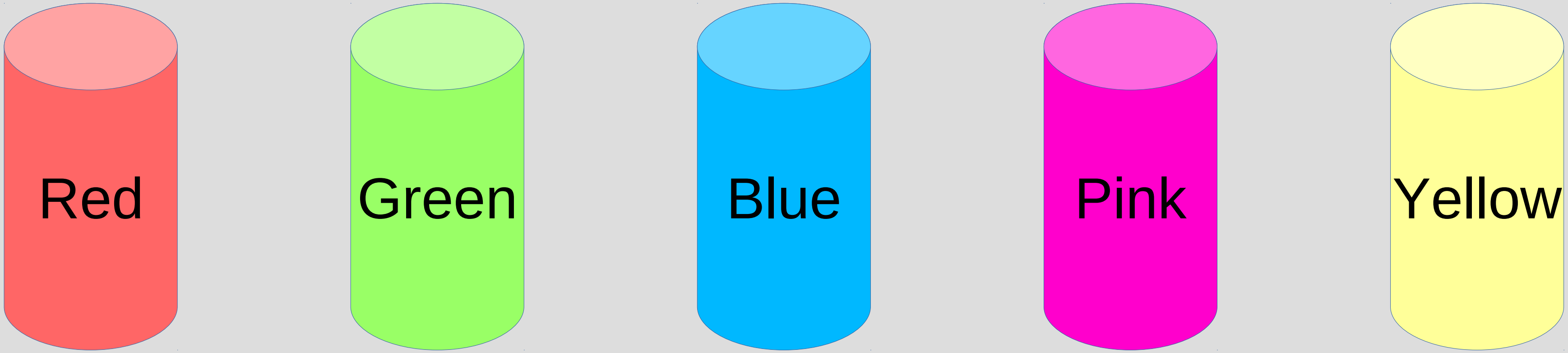
Databases:



Red

Green

Blue

Pink

Yellow

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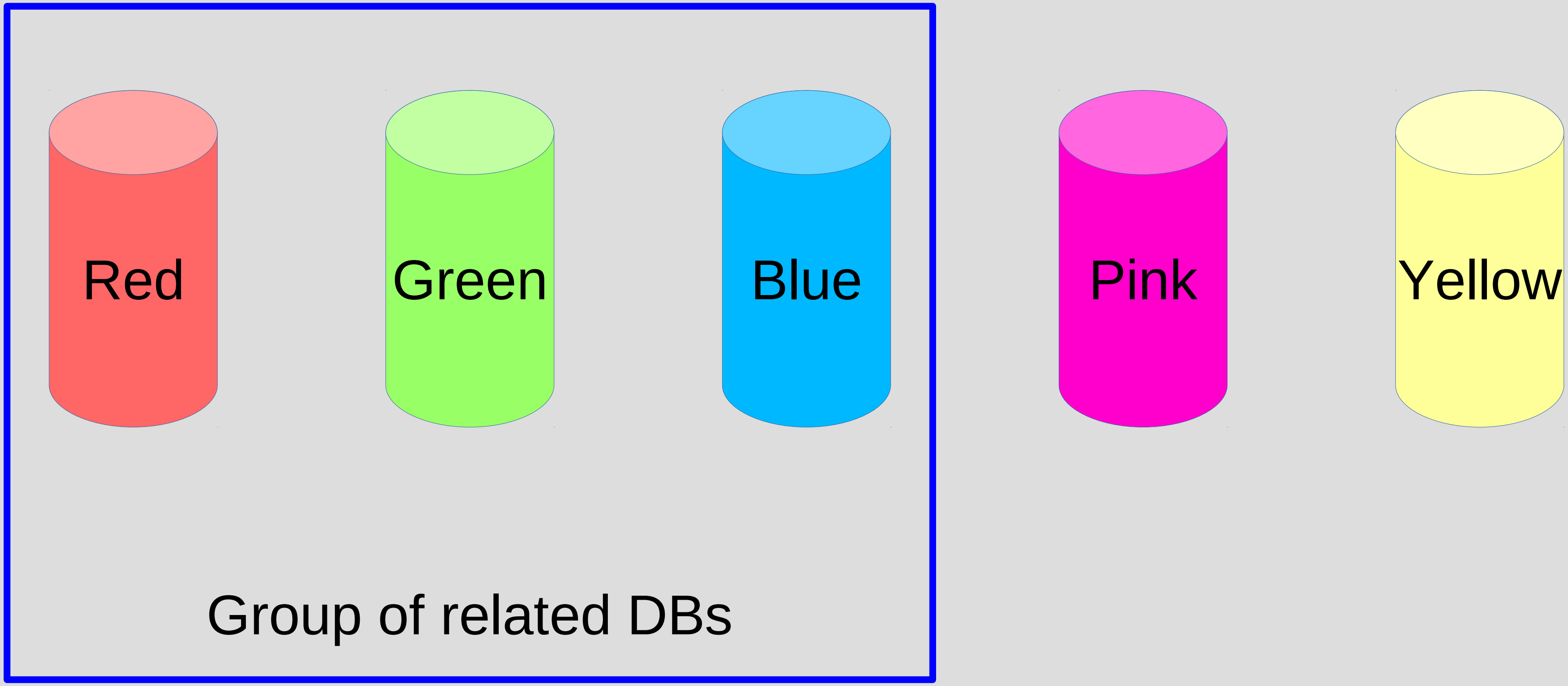
Databases:



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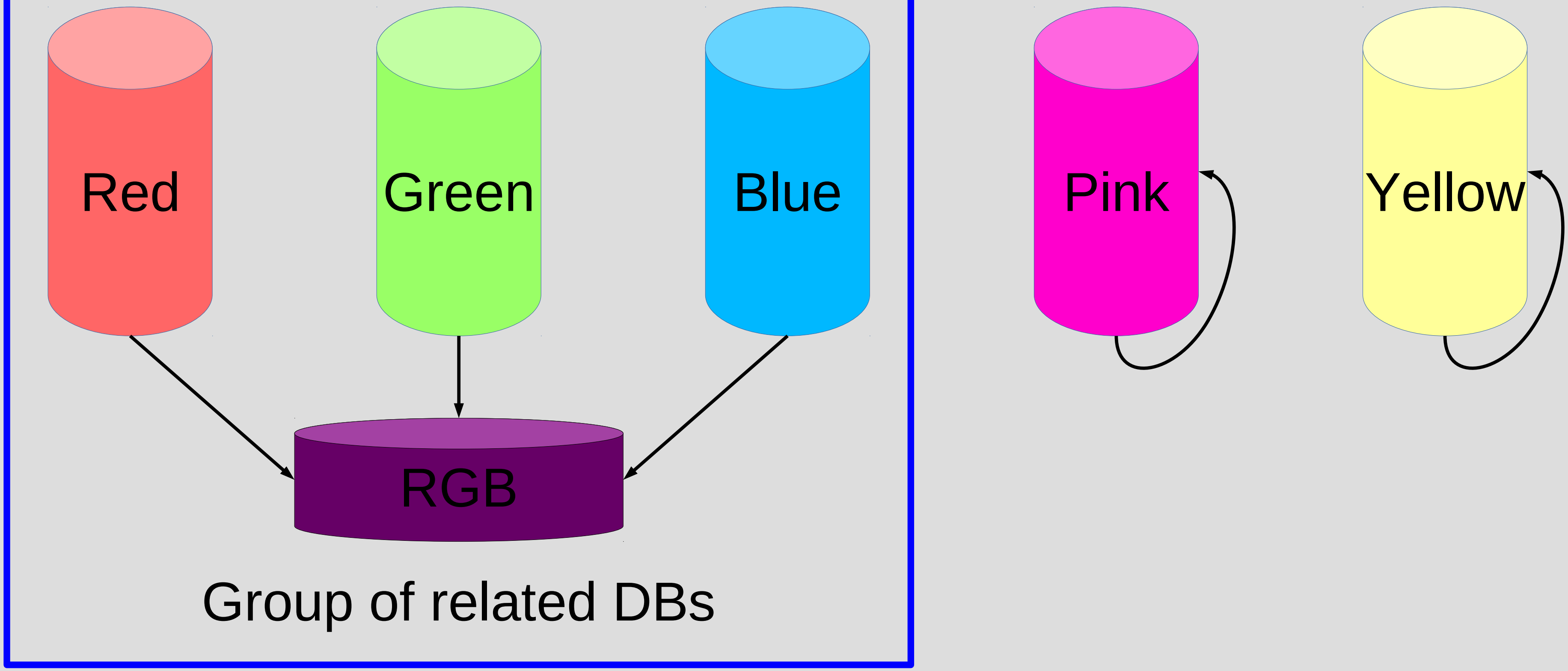
Databases:



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databases.conf (former aliases.conf)

```
Red=/db/Red.fdb
{
    SecurityDatabase=RGB
}
Green=/db/Green.fdb
{
    SecurityDatabase=RGB
}
Blue=/db/Blue.fdb
{
    SecurityDatabase=RGB
}
Pink=/db/Pink.fdb
{
    SecurityDatabase=Pink
}
Yellow=/reserve/Yellow.fdb
{
    SecurityDatabase=Yellow
}
RGB=/reserve/Magenta.fdb
```

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- What about cross-database query?

```
EXECUTE STATEMENT SQL_TEXT
        ON EXTERNAL 'Green'
```

- Only between databases with same security database

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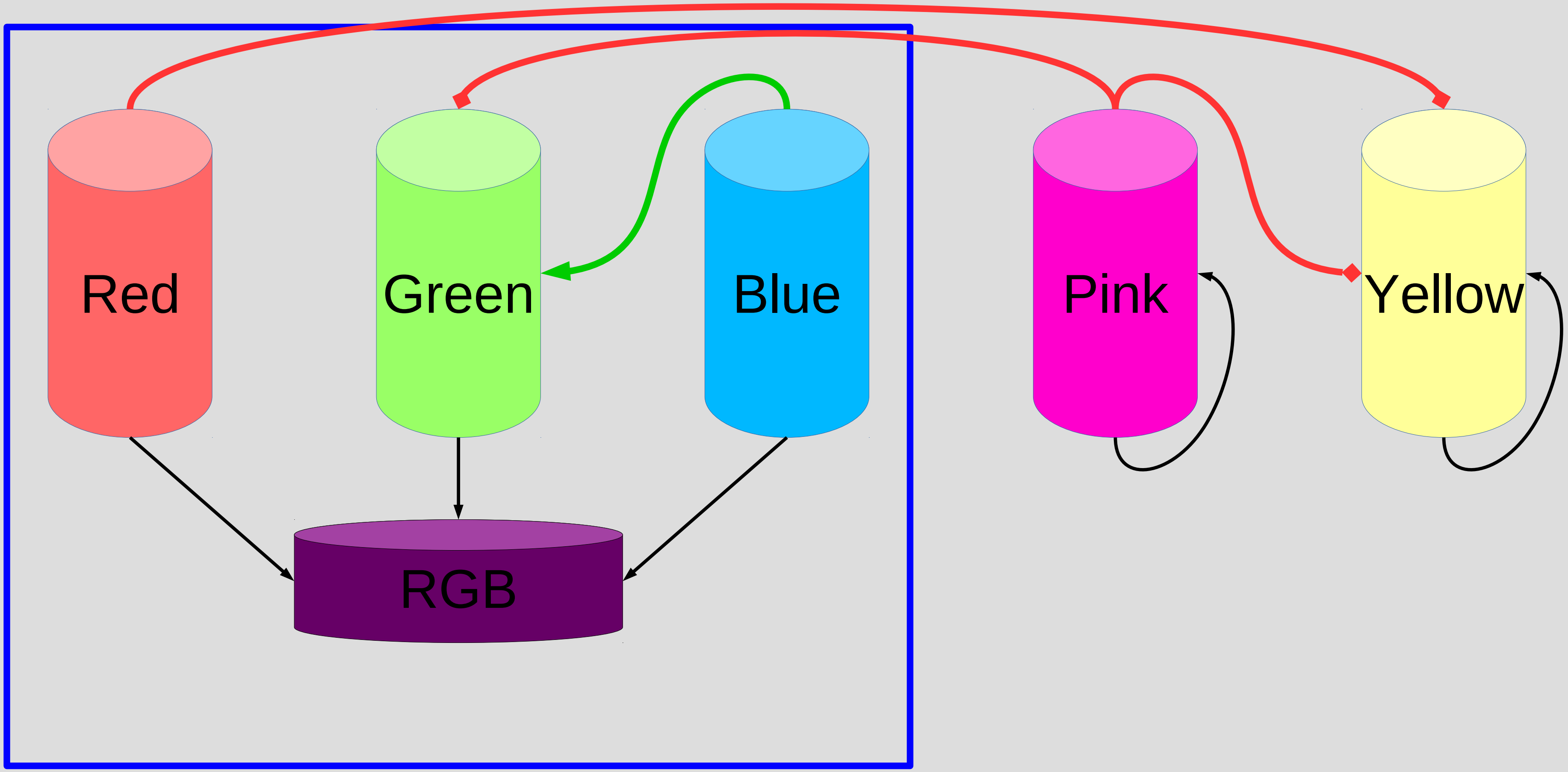
Databases:



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- What about cross-database query?

```
EXECUTE STATEMENT SQL_TEXT
            ON EXTERNAL 'Yellow'
            USER 'Login' PASSWORD '***'
```

- Metadata (procedure sources) is world readable

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- What about cross-database query?

```
EXECUTE STATEMENT SQL_TEXT
          ON EXTERNAL 'Yellow'
          ~~USER 'Login' PASSWORD '***'~~
```

- INSECURE!!!

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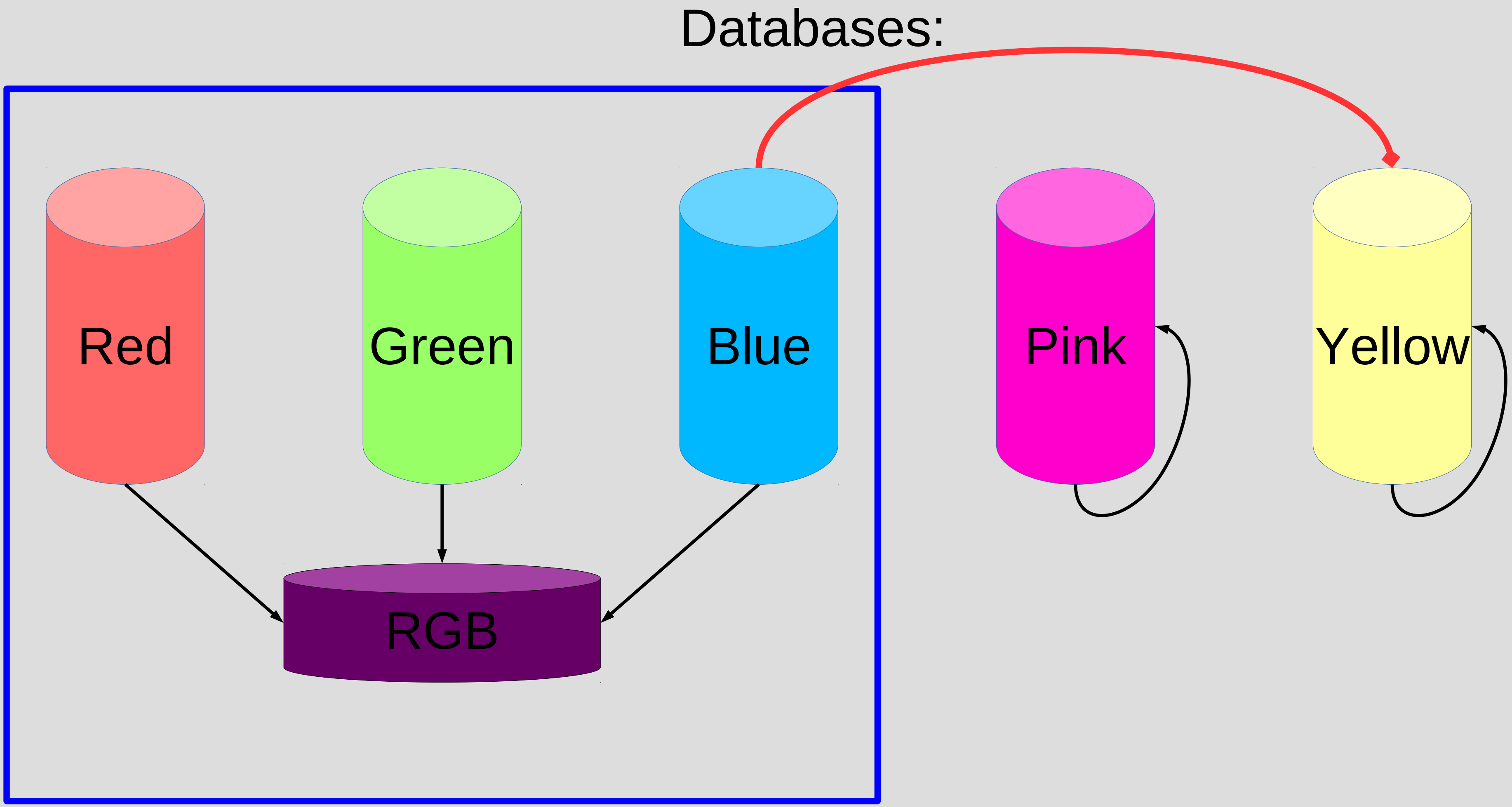

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- CREATE MAPPING
  - Authorization source
  - Existing authorization object
  - New authorization object

- CREATE MAPPING <name>
  USING clause
  FROM clause
  TO clause

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- USING clause:
  - USING PLUGIN <name> [IN <sec-db name>]
    - using plugin srp
    - using plugin legacy_auth in pink
    - ~~using plugin win_sspi in yellow~~
  - USING ANY PLUGIN [IN <sec-db name>]
    - using any plugin in pink
  - USING ANY PLUGIN SERVERWIDE
  - USING MAPPING [IN <sec-db name>]
    - using mapping in pink
  - USING * [IN <sec-db name>]
    - using * in rgb

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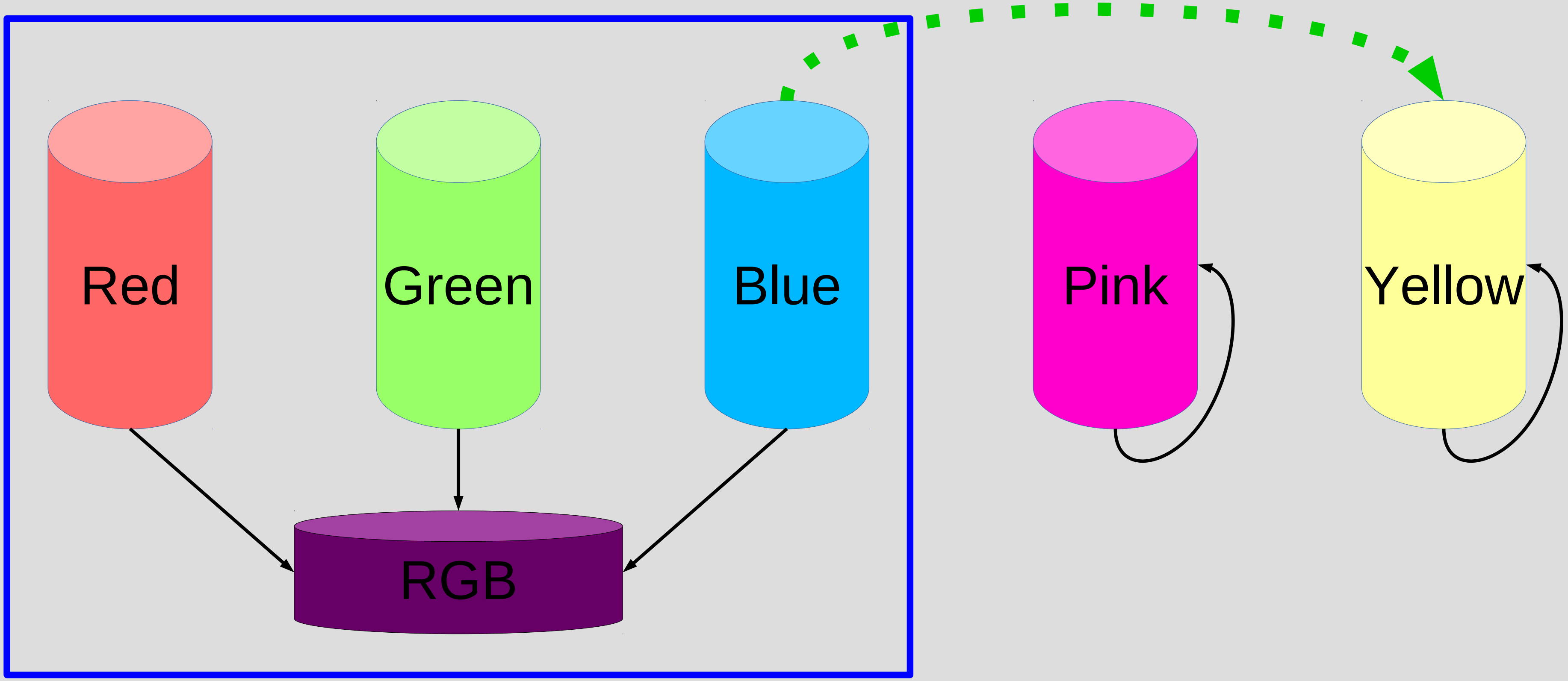
Databases:



CREATE MAPPING FROM_RGB USING * IN RGB ...

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- FROM clause
  - FROM <object-type> <object-name>
    - from user sysdba
    - from group administrators
  - FROM ANY <object-type>
    - from any user

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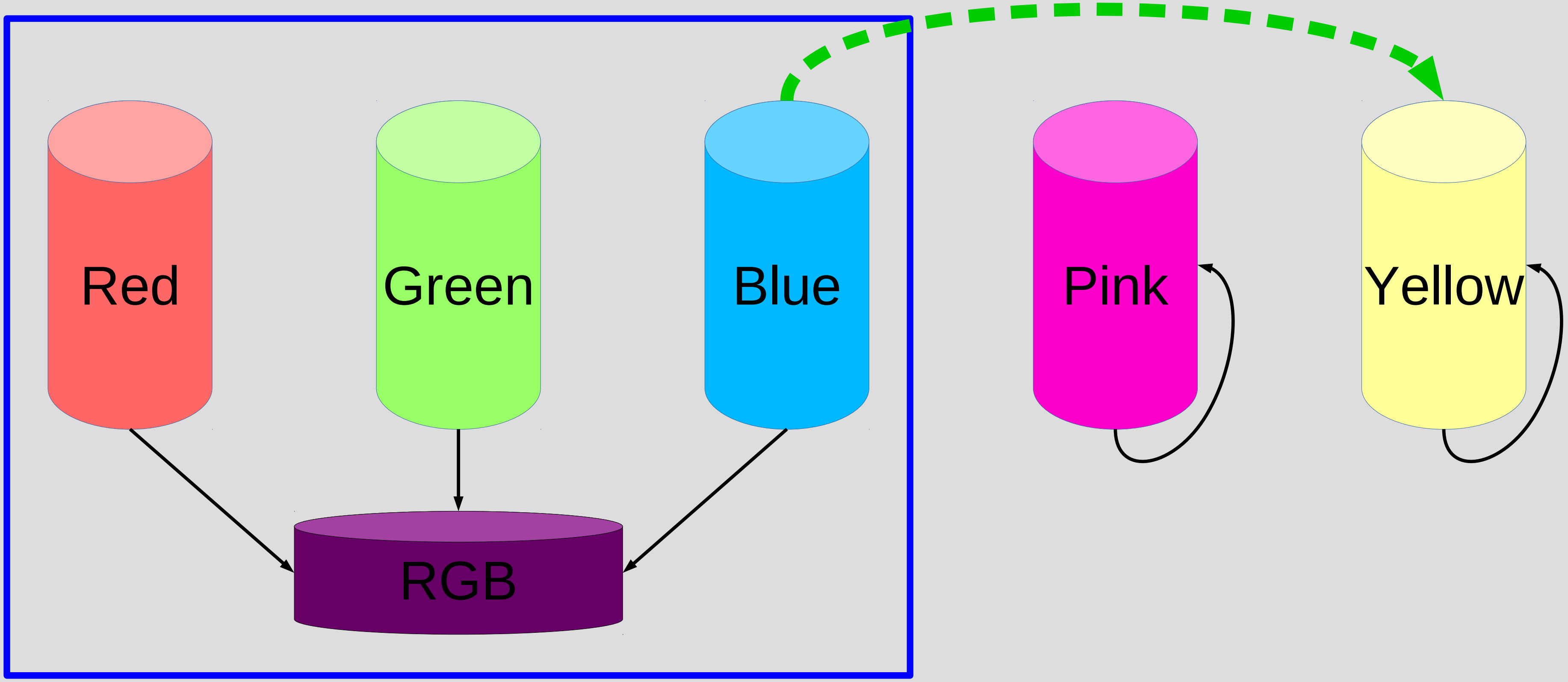
Databases:



```
CREATE MAPPING FROM_RGB USING * IN RGB
    FROM ANY USER ...
```

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- TO clause
  - TO ROLE [<role-name>]
    - to role
  - TO USER [<user-name>]
    - to user RedGuest

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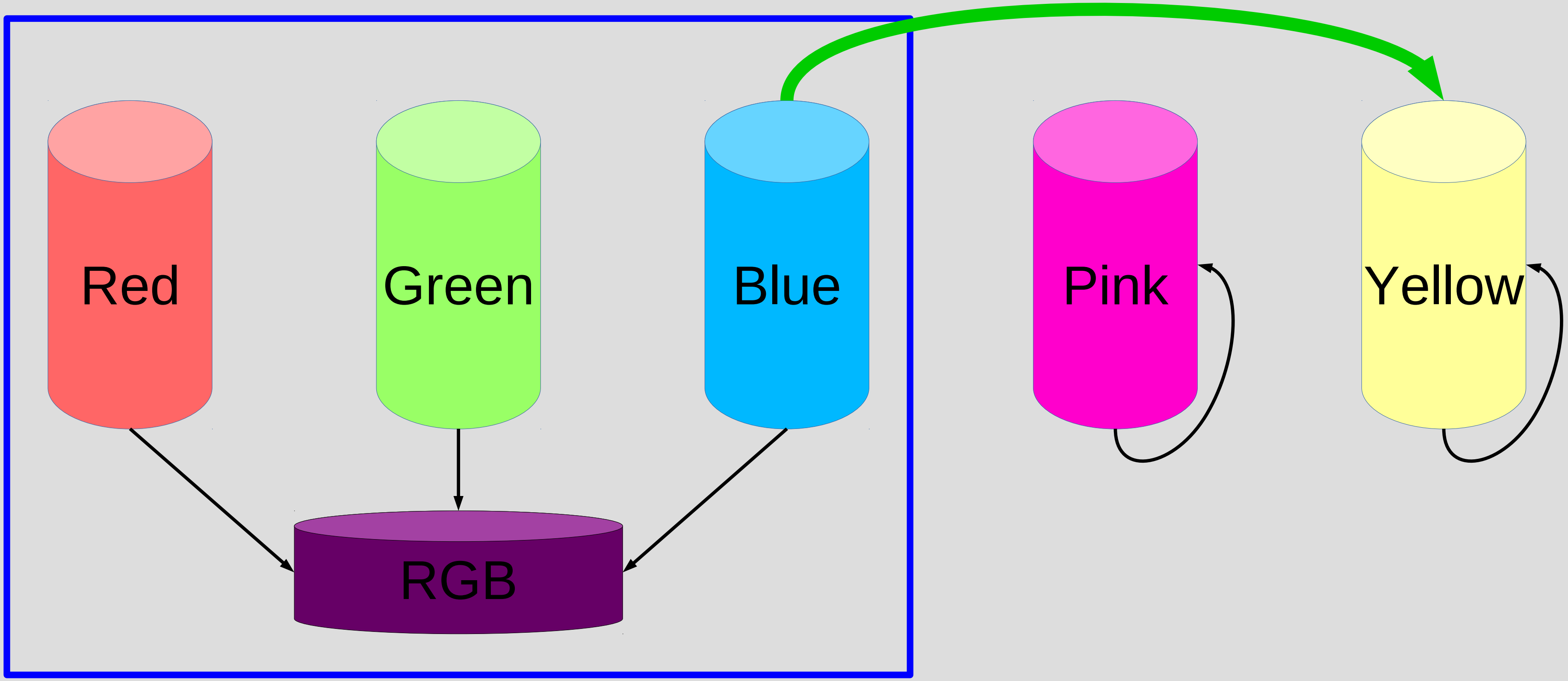
Databases:



```
CREATE MAPPING FROM_RGB USING * IN RGB
FROM ANY USER TO USER RGBGUEST
```

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- Using services API with multiple security databases

  -
    ```
    fbsvcmgr localhost:service_mgr
    user sysdba password masterkey
    action_db_stats dbname Yellow
    ```

  -
    ```
    fbsvcmgr localhost:service_mgr
    user sysdba password YellowMaster
    action_db_stats dbname Yellow
    ```
  - Both fail

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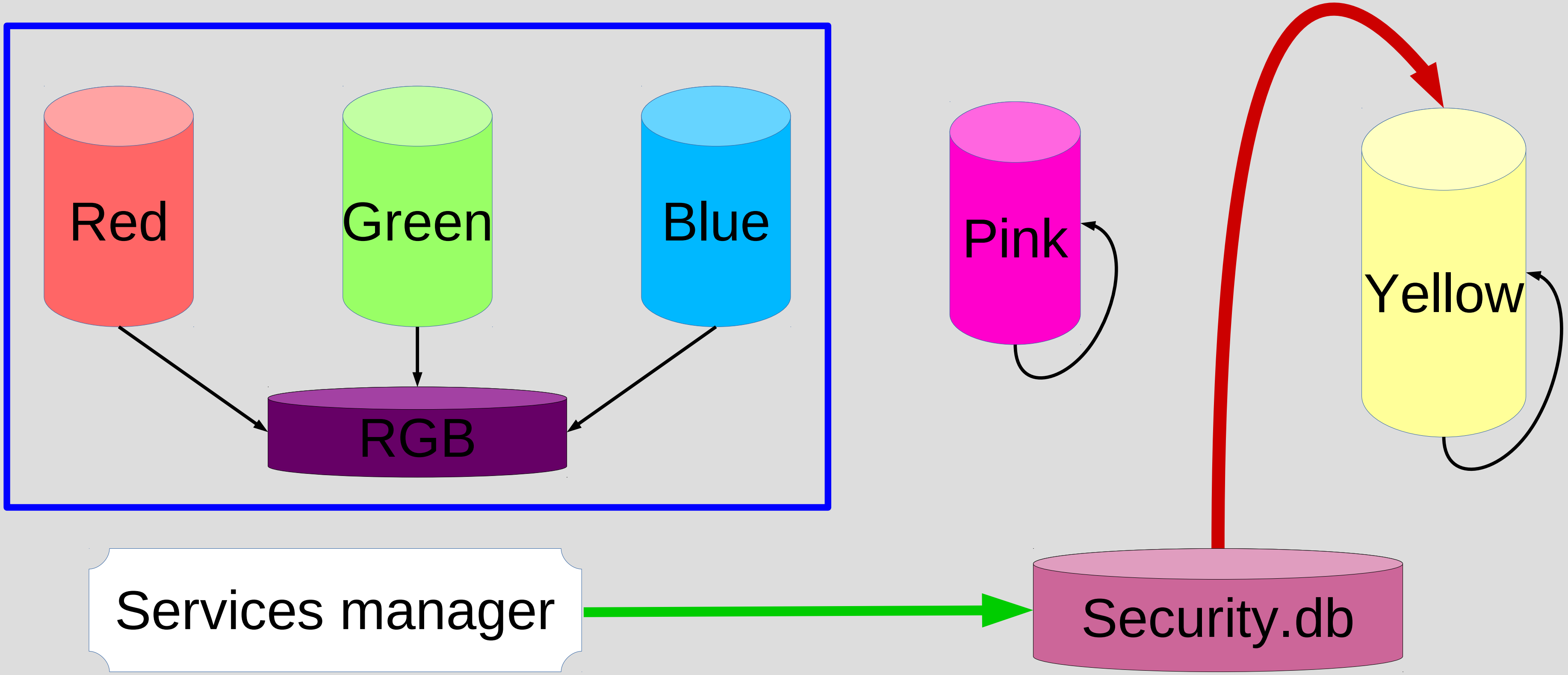
Using services API with multiple security databases



fbsvcmgr localhost:service_mgr
user sysdba password masterkey
action_db_stats dbname Yellow

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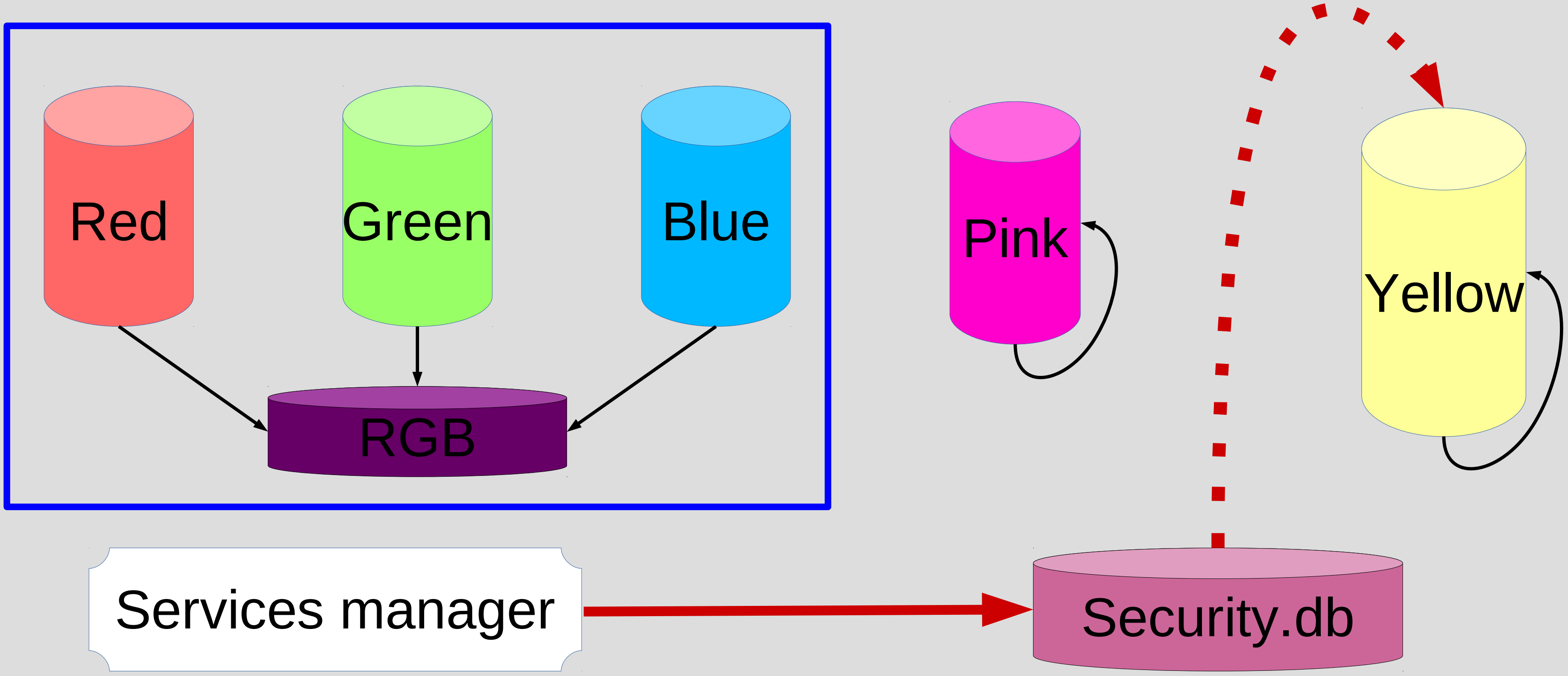
Using services API with multiple security databases



fbsvcmgr localhost:service_mgr
user sysdba password YellowMaster
action_db_stats dbname Yellow

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- Using services API with multiple security databases
  - New parameter when attaching to server: isc_spb_expected_db <dbname>
  - fbsvcmgr localhost:service_mgr
    user sysdba password YellowMaster
    expected_db Yellow
    action_db_stats dbname Yellow

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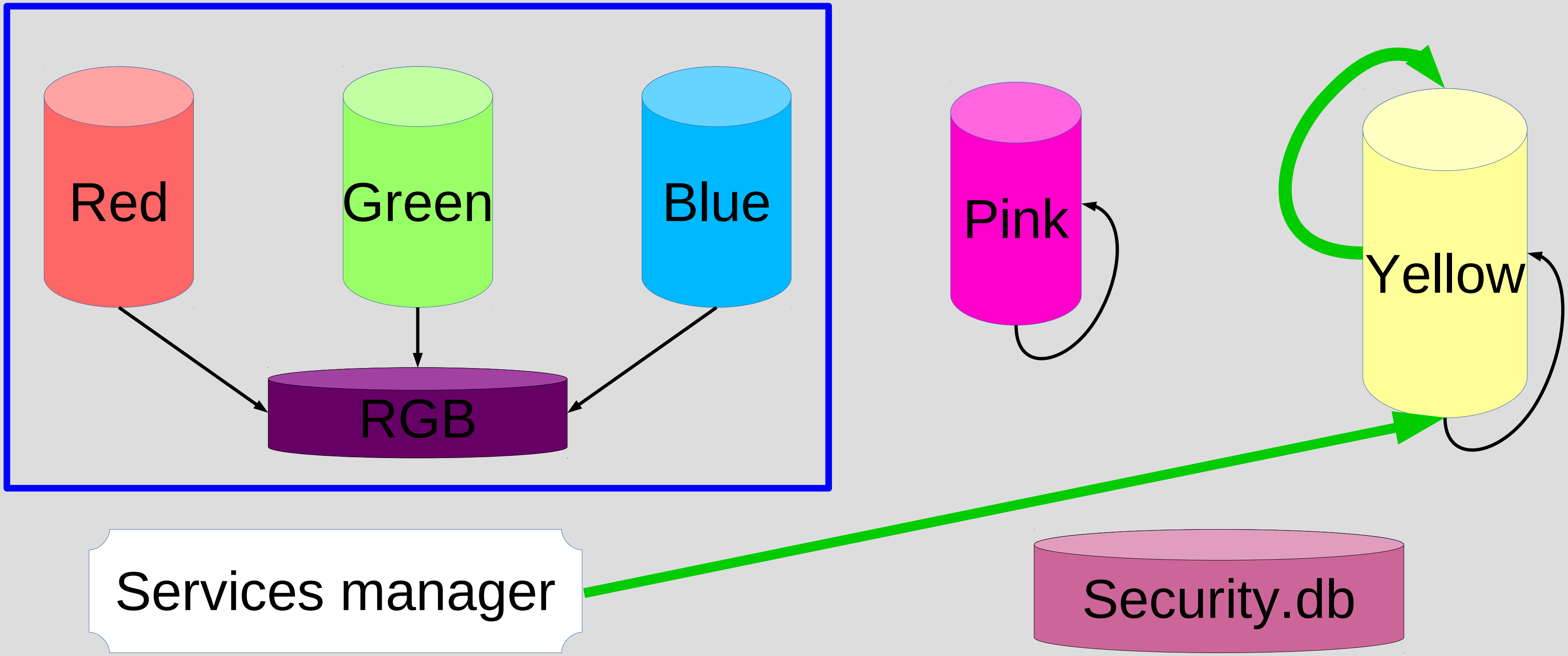
Using services API with multiple security databases



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- Using services API with multiple security databases
  - Create appropriate mapping:

  -
    ```
    create mapping DefDba
    using plugin Srp in "security.db"
    from user sysdba to user
    ```

  -
    ```
    fbsvcmgr localhost:service_mgr
    user sysdba password masterkey
    action_db_stats dbname Yellow
    ```

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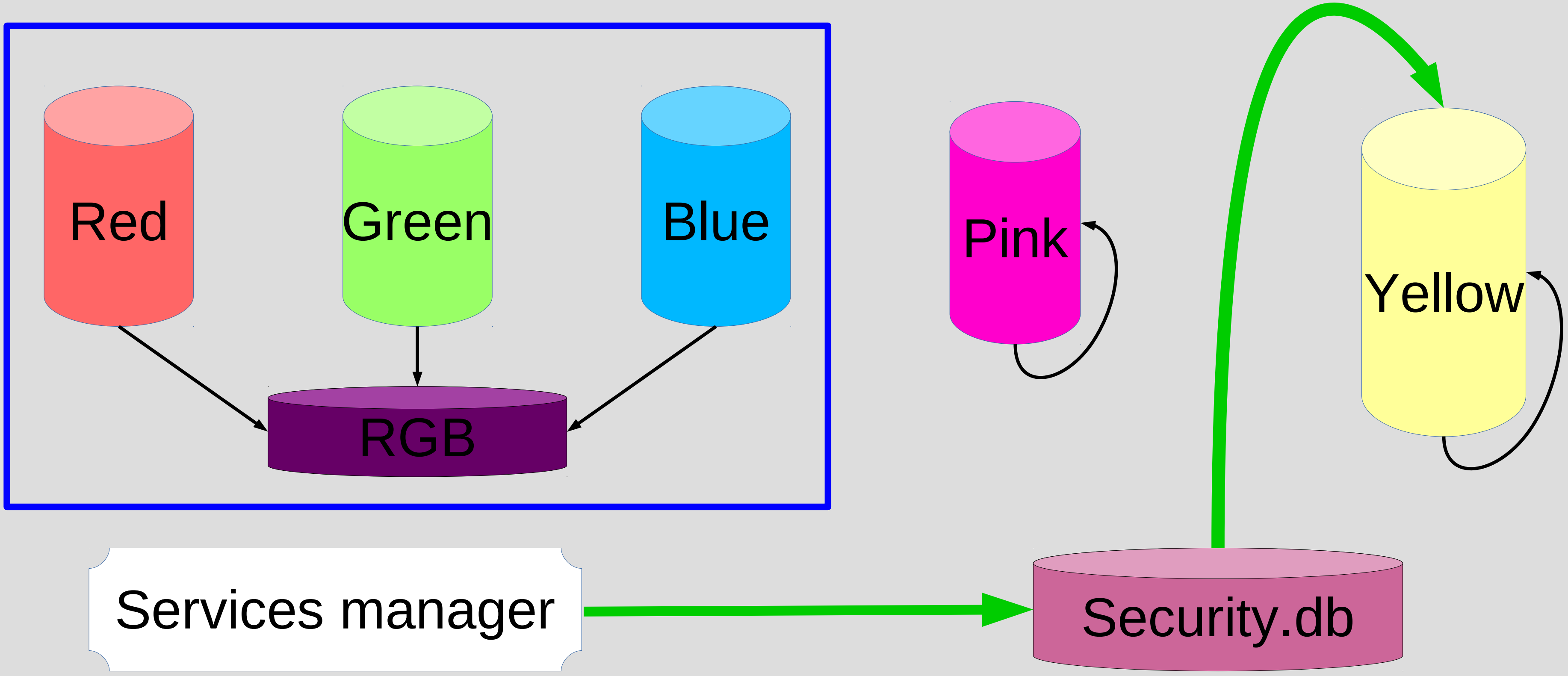
Using services API with multiple security databases



```
CREATE MAPPING DEFDBA USING PLUGIN SRP
IN "SECURITY.DB" FROM USER SYSDBA TO USER
```

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- Using trace API with multiple security databases
  - Audit session can access any database
  - Use expected_db (like any other service)
  - Use mapping
- Use of mapping makes it possible to trace databases from different security groups in same trace session

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- SRP
  - Resistant to all kinds of attacks except brute force
  - Produces unique strong session key (needed for wire encryption)
- Why we need other plugins?

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- Plugin implementing “trusted computer”
  - Each login from given box should have fixed predefined user name (CURRENT_USER)
  - No need to enter login/password

- Environment

  ISC_USER=BigBoss
  ISC_PASSWORD=BossPassword

- Windows trusted authentication
  - OS dependent
  - No encryption key

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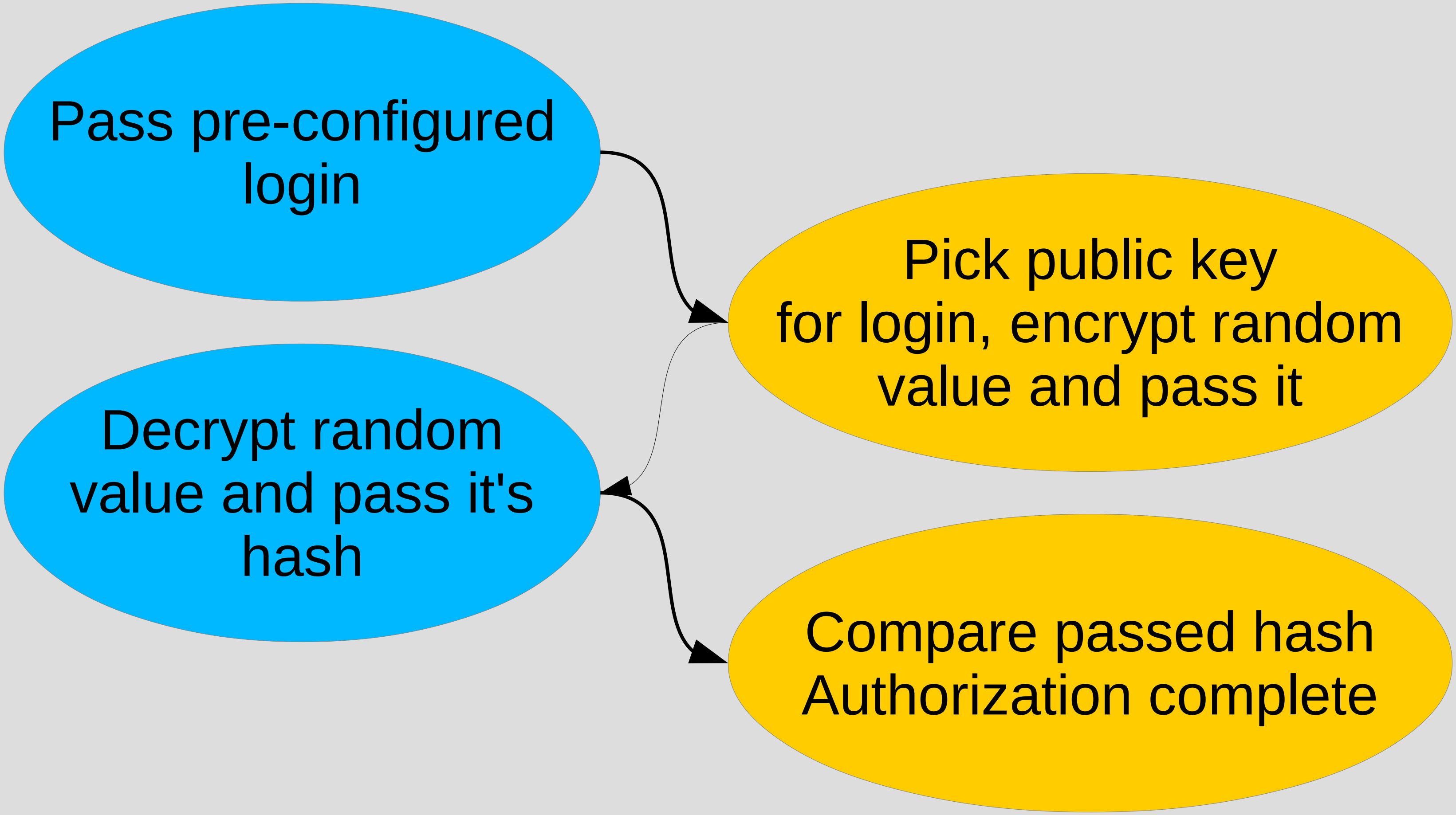
- OS independent plugin (RsaPair)



Pass pre-configured login

Pick public key for login, encrypt random value and pass it

Decrypt random value and pass it's hash

Compare passed hash Authorization complete

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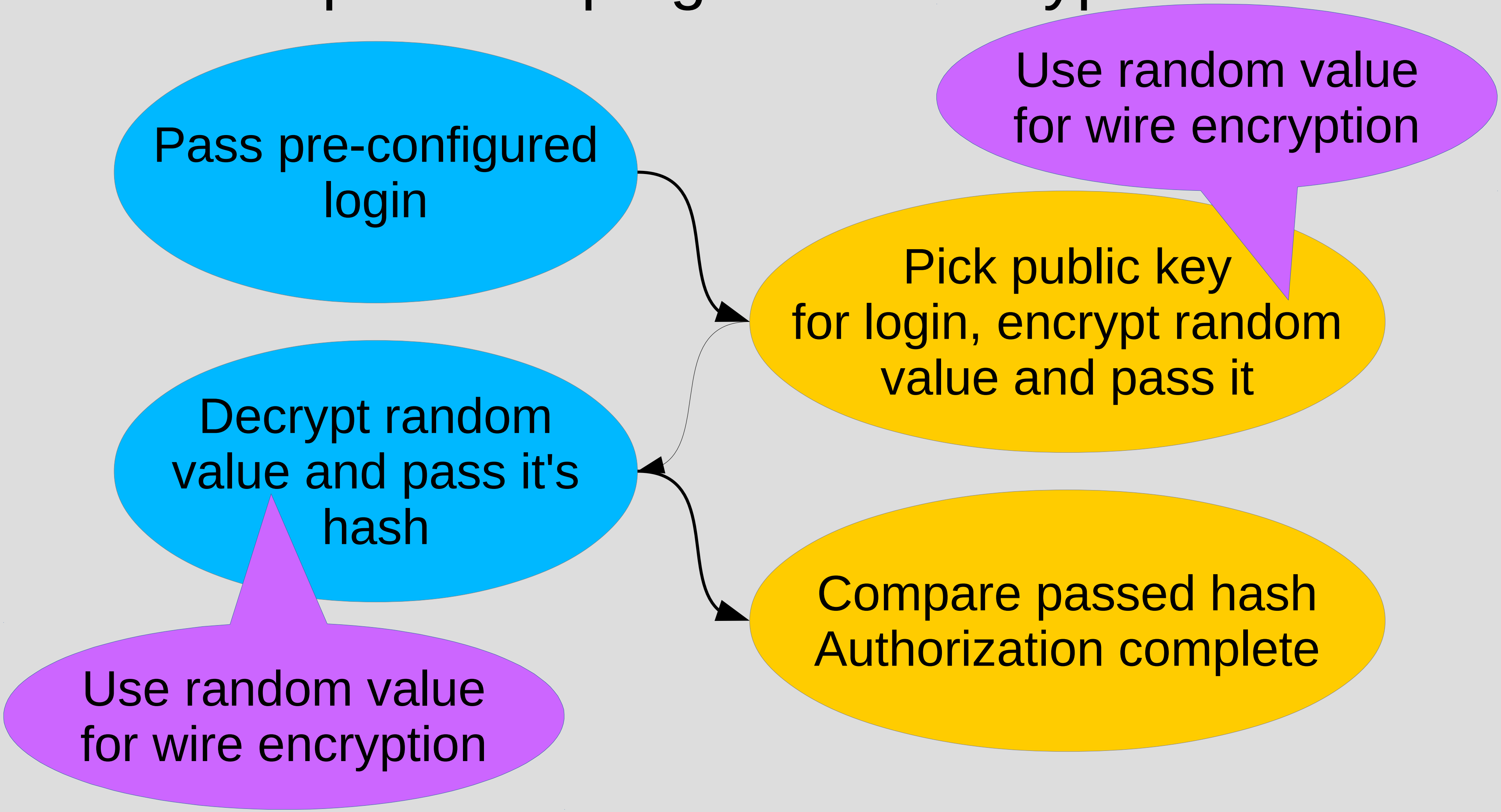
- OS independent plugin with encryption



Pass pre-configured login

Pick public key for login, encrypt random value and pass it

Use random value for wire encryption

Decrypt random value and pass it's hash

Use random value for wire encryption

Compare passed hash Authorization complete

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- Use configuration file (RsaPair.conf) for setup

- Server side:

  ```
  BigBoss=<boss public key (long hex string)>
  Management=<one more public key>
  ```

- Client side:

  ```
  Login=BigBoss
  Key=<boss private key>
  ```

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```
CREATE GLOBAL MAPPING BOSSES
USING PLUGIN RsaPair
FROM ANY USER TO USER;
```

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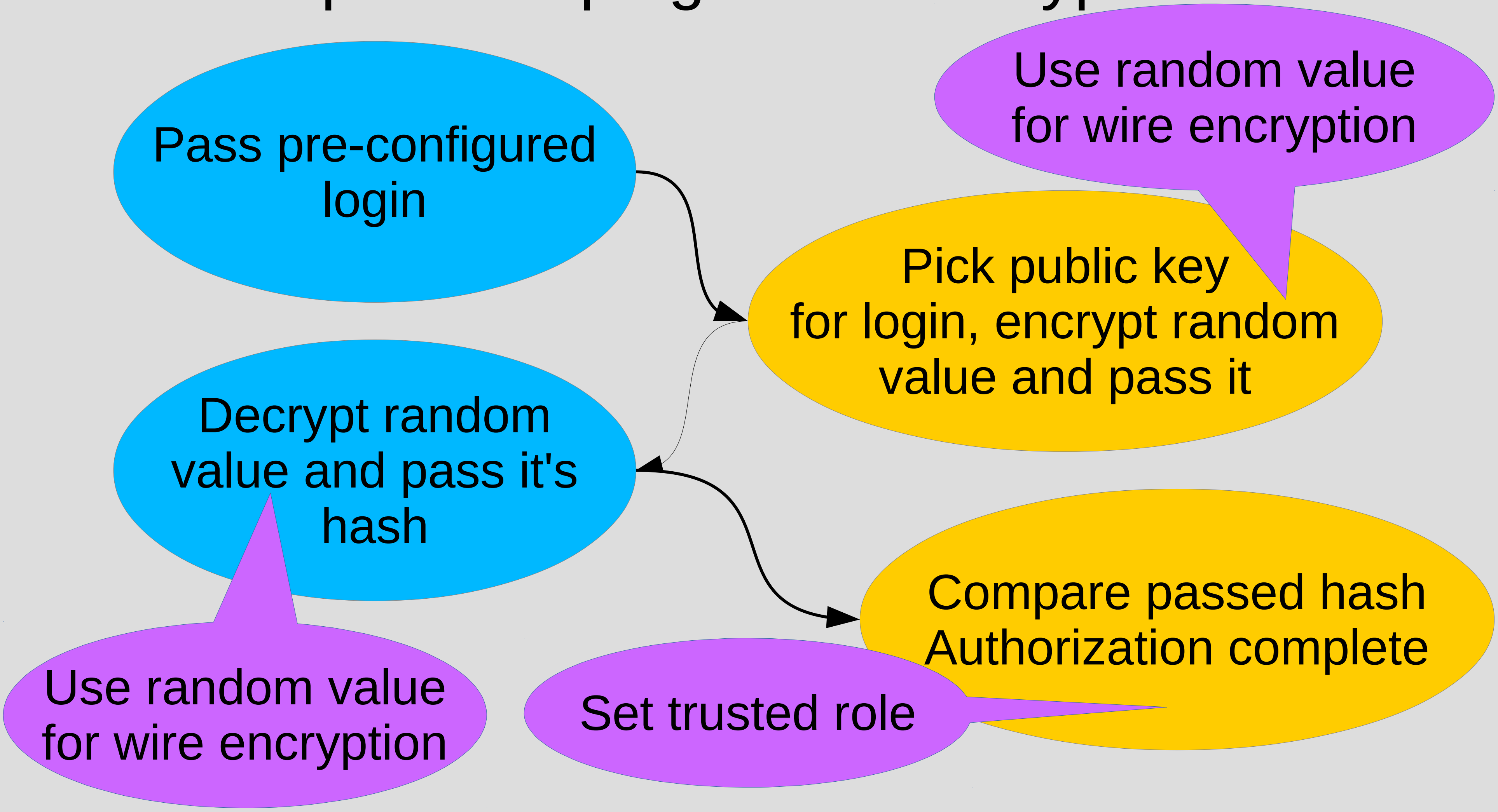
- OS independent plugin with encryption



Pass pre-configured login

Pick public key for login, encrypt random value and pass it

Use random value for wire encryption

Decrypt random value and pass it's hash

Use random value for wire encryption

Compare passed hash Authorization complete

Set trusted role

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```
CREATE GLOBAL MAPPING RsaRoles
USING PLUGIN RsaPair
FROM ANY ROLE TO ROLE;
```

- RsaPair.conf:

```
BigBoss=<boss public key>
BigBossRole=GuestRole
Management=<one more public key>
```

Thanks for your attention!