Overview of Red Database 2.5

Roman Simakov, director of system development department

RED SOFT CORPORATION

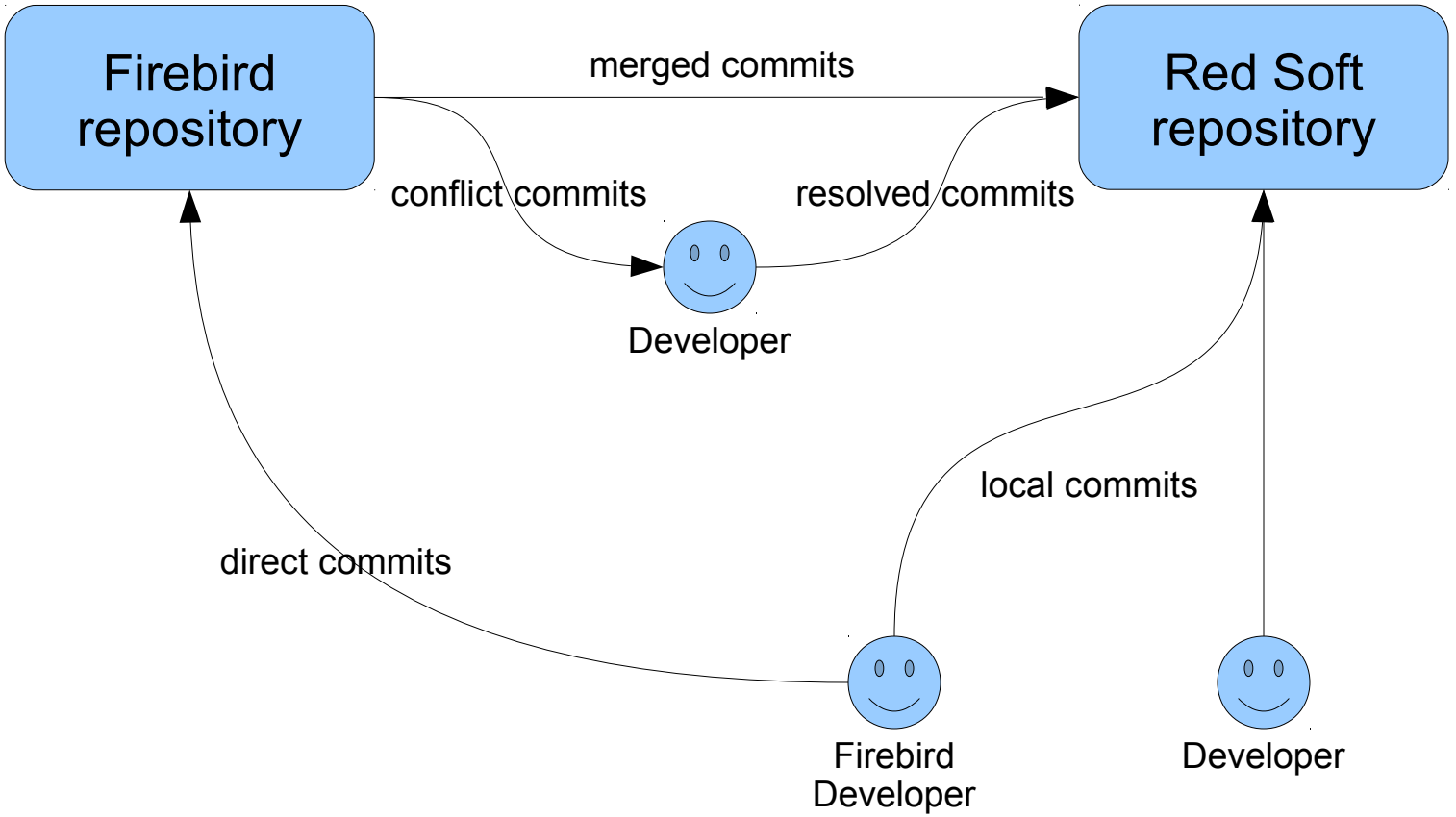
REDSOFT

About company

- Red Soft Corporation was founded in 2006
- All solutions based on **Open Source** code
- The main product is Red Database

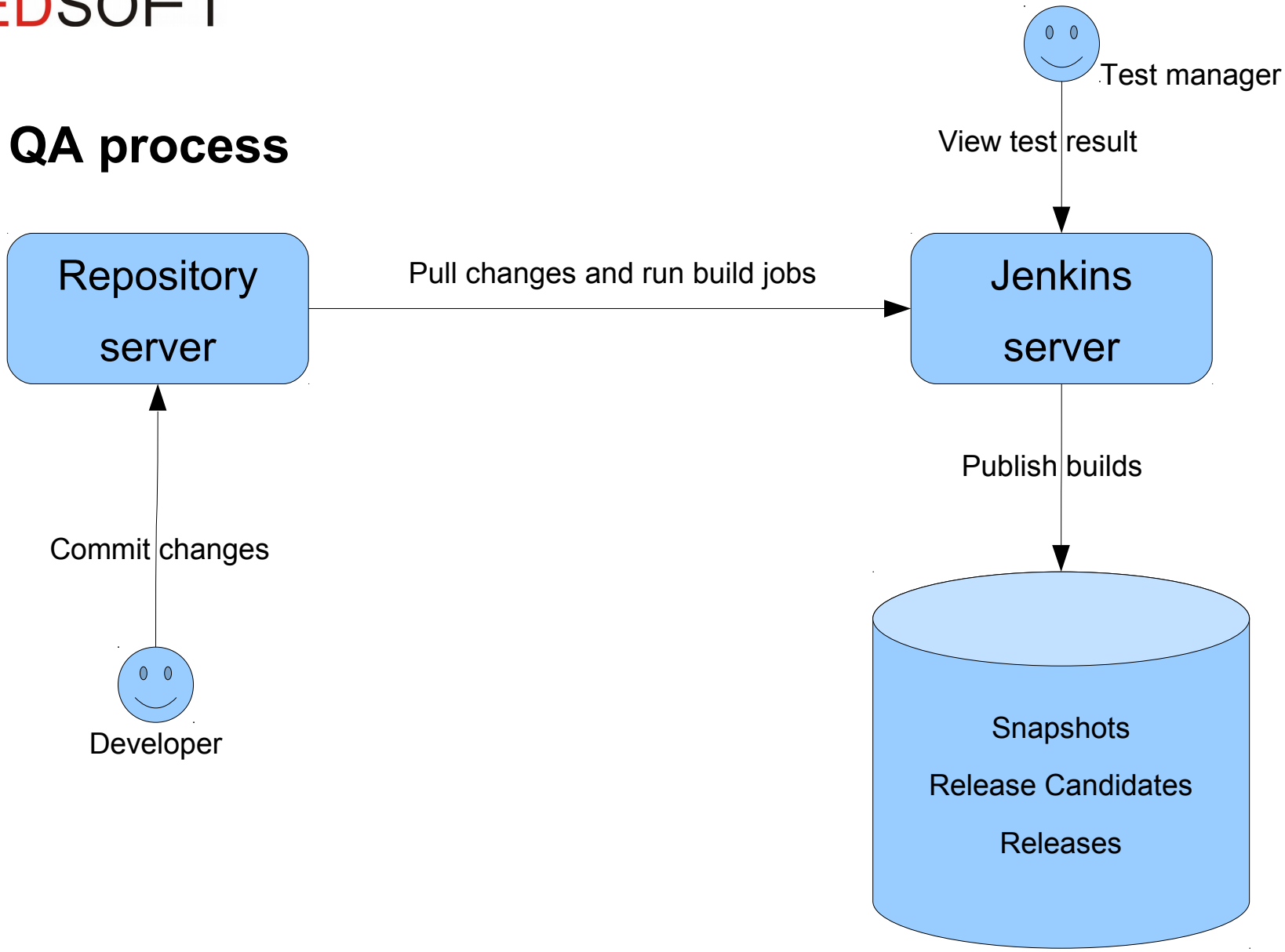
REDSOFT

Development process (schema)



REDSOFT

QA process



REDSOFT

Security features

- Cryptographic plugin
- Multi-factor authentication
- Cumulative roles
- DML access control
- DDL access control
- Service access control
- Record filtering

Functional features

- Java Stored Procedures
- Full Text Search
- OpenLDAP integration
- StandBy cluster (engine-level replication)

REDSOFT

Cryptographic plugin

- It's a key feature used in other features to perform cryptographic operations.
- It allows users to use necessary cryptographic methods required in different countries by using related plugins.
- For Russia CryptoPro library and Windows CryptoAPI are supported.

REDSOFT

Multi-factor authentication

- It allows user to provide several factors to be authenticated: OS context, password, certificate, etc.
- Access to database is defined by login policy. It says what factors user must provide for authentication.
- While authentication all authentication factors are transferred in encoded form.
- After authentication both client and server have session key for exchanging private messages, for example new password when user wants to change it.

REDSOFT

Login policy properties

Parameter name	Description
AUTH_FACTORS	Example: (WINDOWS_NTLM PASSWORD)|(CERT_X509 PASSWORD)
PSWD_NEED_CHAR	The minimum number of characters in the password
PSWD_NEED_DIGIT	The minimum number of digits in the password
PSWD_NEED_DIFF_CASE	Need to use different case of characters in the password
PSWD_MIN_LEN	The minimum password length
PSWD_VALID_DAYS	The password validation interval in days
PSWD_UNIQUE_COUNT	The minimum number of the last unique passwords
MAX_FAILED_COUNT	The maximum number of failed attempt of authentication
MAX_SESSIONS	The maximum number of user sessions to database server
MAX_IDLE_TIME	The maximum idle time interval to user disconnecting

REDSOFT

Login policies

DDL commands to control policies

```
CREATE POLICY <policy_name> AS [param = value [, param = value]];

DROP POLICY <policy_name>;

ALTER POLICY <policy_name> AS [param = value [, param = value]];
```

To grant policy to user use

```
GRANT POLICY <policy_name> TO <user_name>;
```

To revoke policy from user just grant DEFAULT policy to him

```
GRANT POLICY "DEFAULT" TO <user_name>;
```

REDSOFT

Cumulative roles

You can grant role to role except circle references

```
GRANT ROLE1 TO ROLE2;

REVOKE ROLE1 FROM ROLE2;
```

- if user doesn't specify a role he gets permissions of all roles granted to him;
- if user specifies a role he takes privileges of this role only.

REDSOFT

DML access control

Extended permissions for generators/sequences

```
GRANT SELECT | ALTER ON GENERATOR <generator> TO {<user> | <role>} [WITH
GRANT OPTION];

REVOKE SELECT | ALTER ON GENERATOR <generator> FROM {<user> | <role>};

REVOKE GRANT OPTION FOR SET | GET ON GENERATOR <generator> FROM {<user> |
<role>};
```

Extended permissions for table columns

```
GRANT SELECT | INSERT | UPDATE {( column [, ... ] )} ON [TABLE] <table> TO
                    {<user> | <role>} [WITH GRANT OPTION]

REVOKE SELECT | INSERT | UPDATE {( column [, ... ] )} ON [TABLE] <table>
                            FROM {<user> | <role>}

REVOKE GRANT OPTION FOR SELECT | INSERT | UPDATE {( column [, ... ]  )} ON
                    [TABLE] <table> FROM {<user> | <role>}
```

REDSOFT

DDL access control (now in Firebird 3 too)

Extended permissions for creating objects of database

```
GRANT CREATE OBJECT TO {<USER>|<ROLE>} [WITH GRANT OPTION];

REVOKE CREATE OBJECT FROM {<USER>|<ROLE>};
```

Extended permissions for altering/droping objects of database

```
GRANT ALTER|DROP [ANY] OBJECT TO {<USER>|<ROLE>} [WITH GRANT OPTION];

REVOKE ALTER|DROP [ANY] OBJECT FROM {<USER>|<ROLE>};
```

Where OBJECT can be:

TABLE, TRIGGER, PROCEDURE, VIEW, DOMAIN, ROLE, GENERATOR,

SEQUENCE, EXCEPTION, SHADOW, FUNCTION, INDEX, POLICY

REDSOFT

Service access control

It's able to grant permissions to start some services

(GBAK, GFIX, GSTAT, GSEC)

```
GRANT EXECUTE ON SERVICE <SERVICE_NAME> TO {<USER>|<ROLE>}

REVOKE EXECUTE ON SERVICE <SERVICE_NAME> FROM {<USER>|<ROLE>}
```

- Permissions can be granted to *users* or *global roles* stored in security2.fdb.
- Permissions can be granted by SYSDBA or by user with SECADMIN global role.

REDSOFT

Record filtering

- Based on special SELECT triggers.
- It allows user to skip the records if the given condition is false.
- It allows user to clear some fields of records if the given condition is false.
- It's used to filter system catalog to prevent user without any permissions on database object even to know about its existence.

REDSOFT

Record filter syntax

User can declare filters in CREATE TABLE

```
CREATE TABLE <table_name> [EXTERNAL [FILE] "<filespec>"] (<col_def> [,
<col_def> | <tconstraint> ...], [COLFILTER <col_name> (<condition>), ...])
[, RECFILTER (<condition>)]
```

To manage filters use ALTER TABLE

```
ALTER TABLE table SET RECFILTER (<condition>);

ALTER TABLE table DROP RECFILTER;

ALTER TABLE table SET COLFILTER <col_name> (<condition>);

ALTER TABLE table DROP COLFILTER <col_name>;
```

REDSOFT

Java Stored Procedures

- It's possible to develop both user defined procedures and user defined functions
- Portable code on widely used programing language
- It's possible to re-use a lot of libraries
- Java SP can return result set which allow them to be used as data source.
- Can be used to exchange data with other databases.

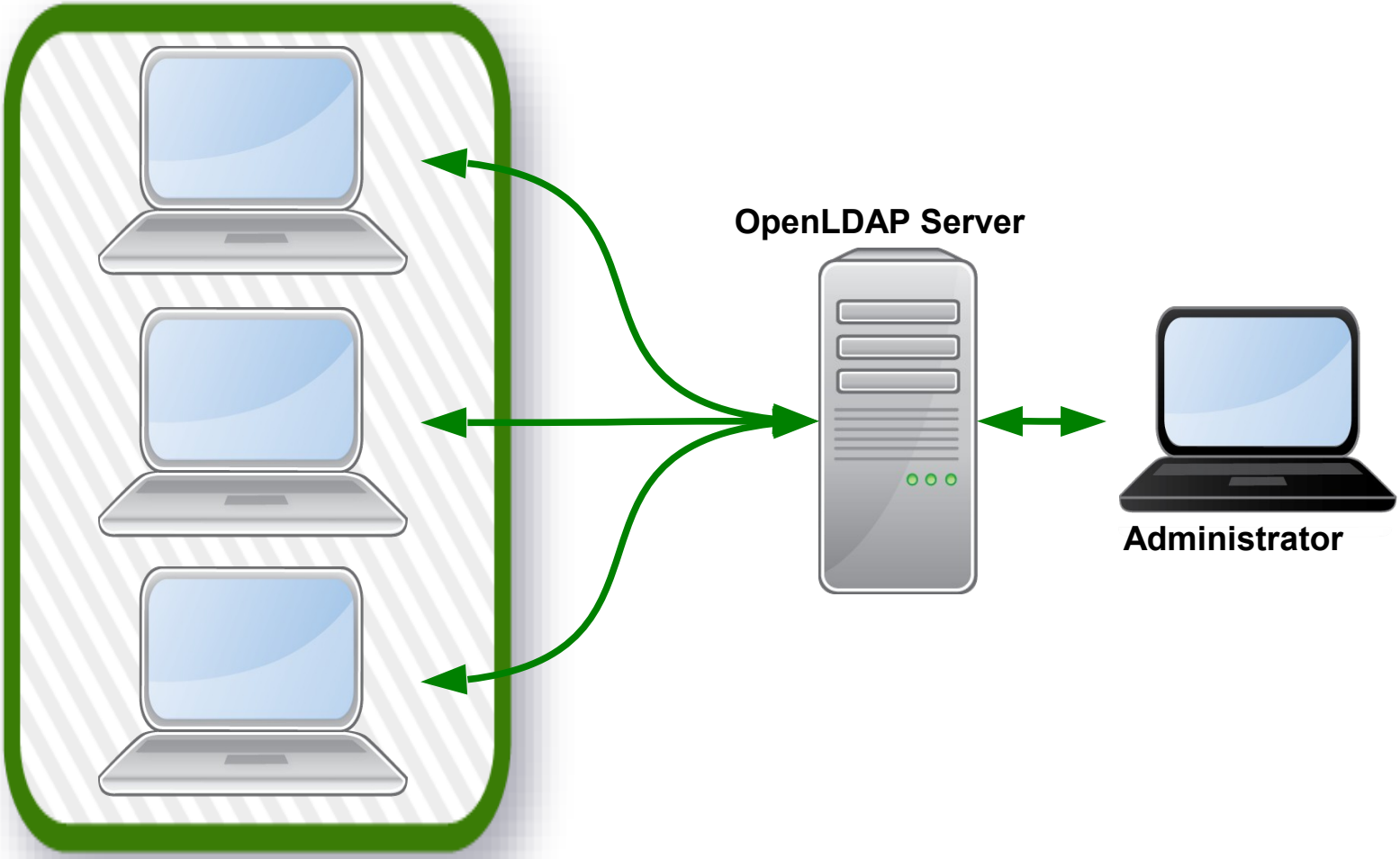
REDSOFT

Full Text Search

- Based on high performance cross-platform engine lucene (https://lucene.apache.org/)
- Can perform search by several tables and fields
- Can search in the most widely used file formats: **rtf, doc, open office, pdf**, etc.

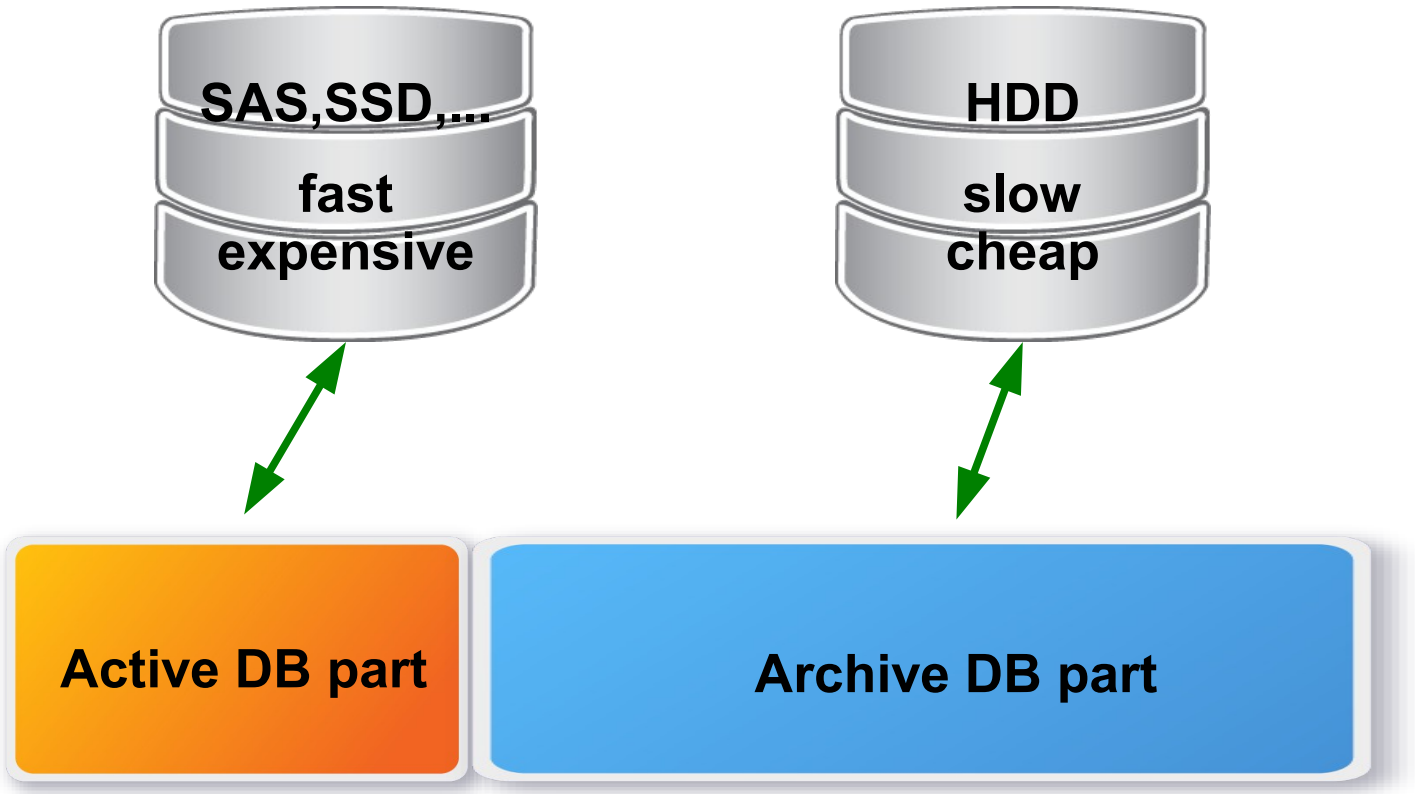
REDSOFT

Integration with OpenLDAP



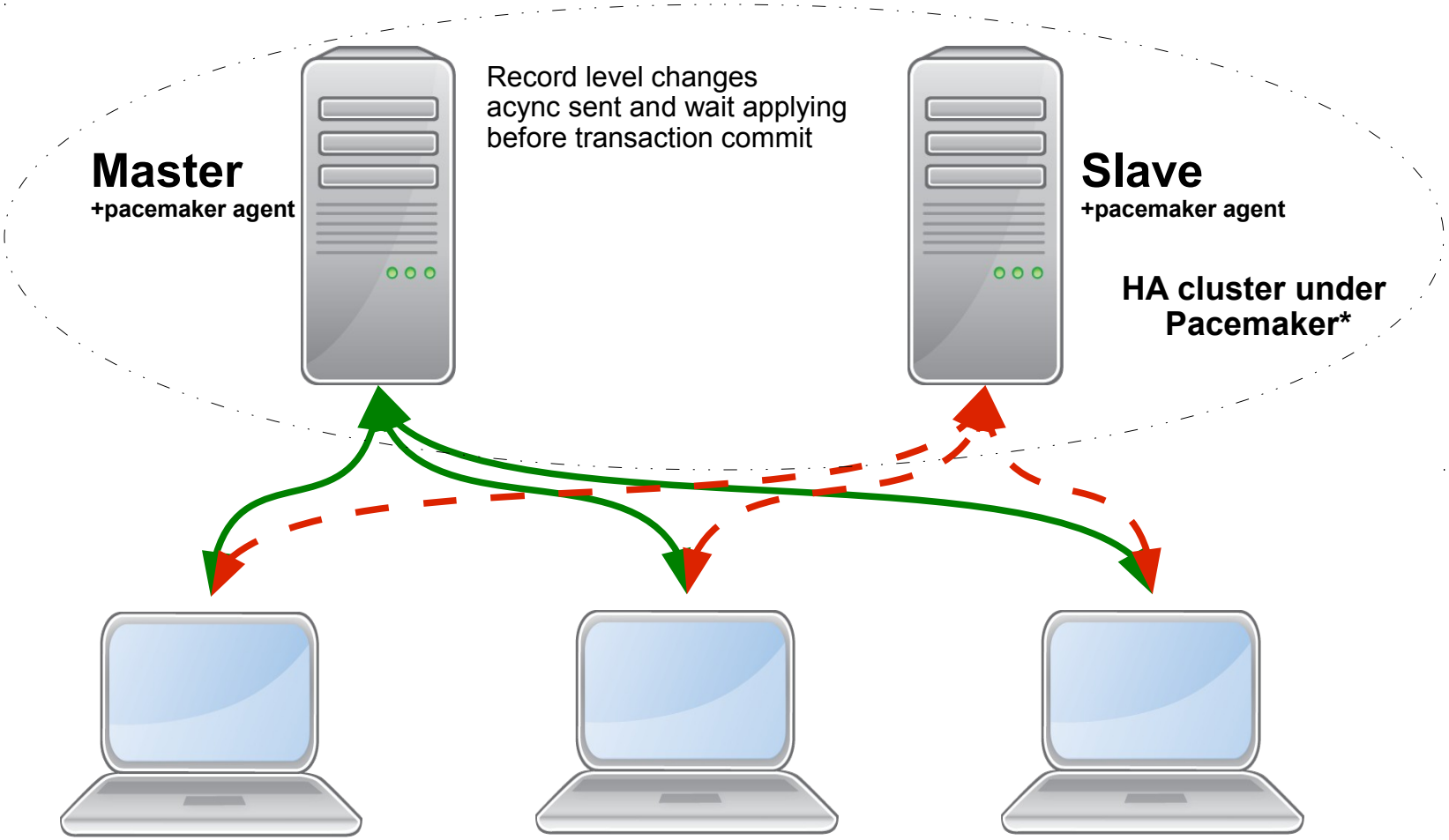
REDSOFT

Optimization work with Storages



REDSOFT

StandBy cluster (with sync replication)



* More about pacemaker at http://clusterlabs.org

REDSOFT

Automated Information System of Federal Service for Officers of Justice of Russia

- AIS is installed and work in 85 regional departments and in the main office of FSOJ of Russia
- Total amount of Red Database installations are about 2720, i.e. every city of Russia has one or several Red Database servers
- AIS handles more than 10^9 documents per year
- AIS works in 24/7 mode
- Some databases more than 1TB and a lot of data goes to archived set of database files
- 100x of concurrent connections
- 100 000x transactions per hour

REDSOFT

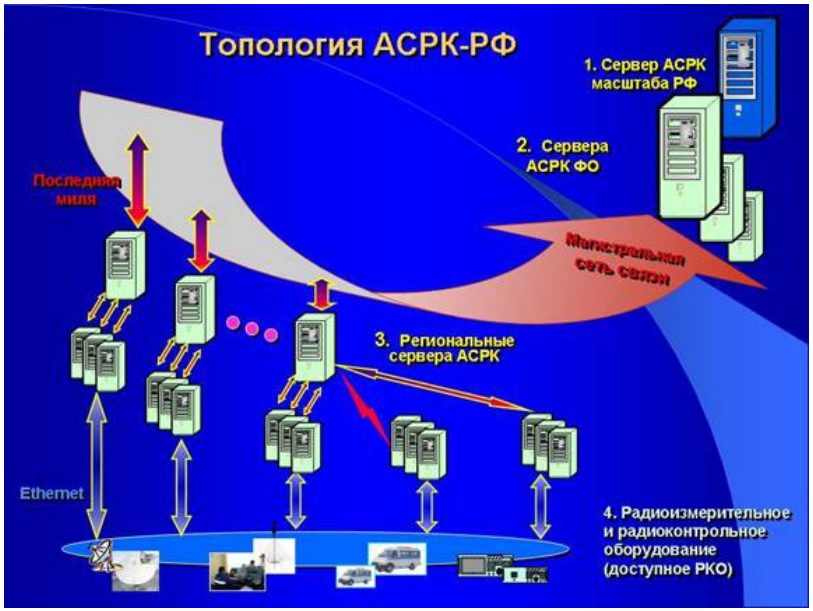
Regional medical information system

smart delta systems
МЕДИЦИНСКИЕ ИНФОРМАЦИОННЫЕ СИСТЕМЫ

- Partner is SmartDeltaSystems Ltd. (http://www.sdsys.ru/)
- Migration from Firebird because of they need to have certified solution and support
- Work on CentOS and Windows
- ~200 installations
- Size of databases up to 12 GB
- Central database size is about 50 GB
- 1000x concurrent connections

REDSOFT

Automated server of radiomonitoring of Russia



- The main database is ~700 GB
- Regional - 100x GB
- Increased by 10x GB per year
- 600 000 transactions per day
- 100x concurrent connections
- OpenLDAP authentication

REDSOFT

Awards

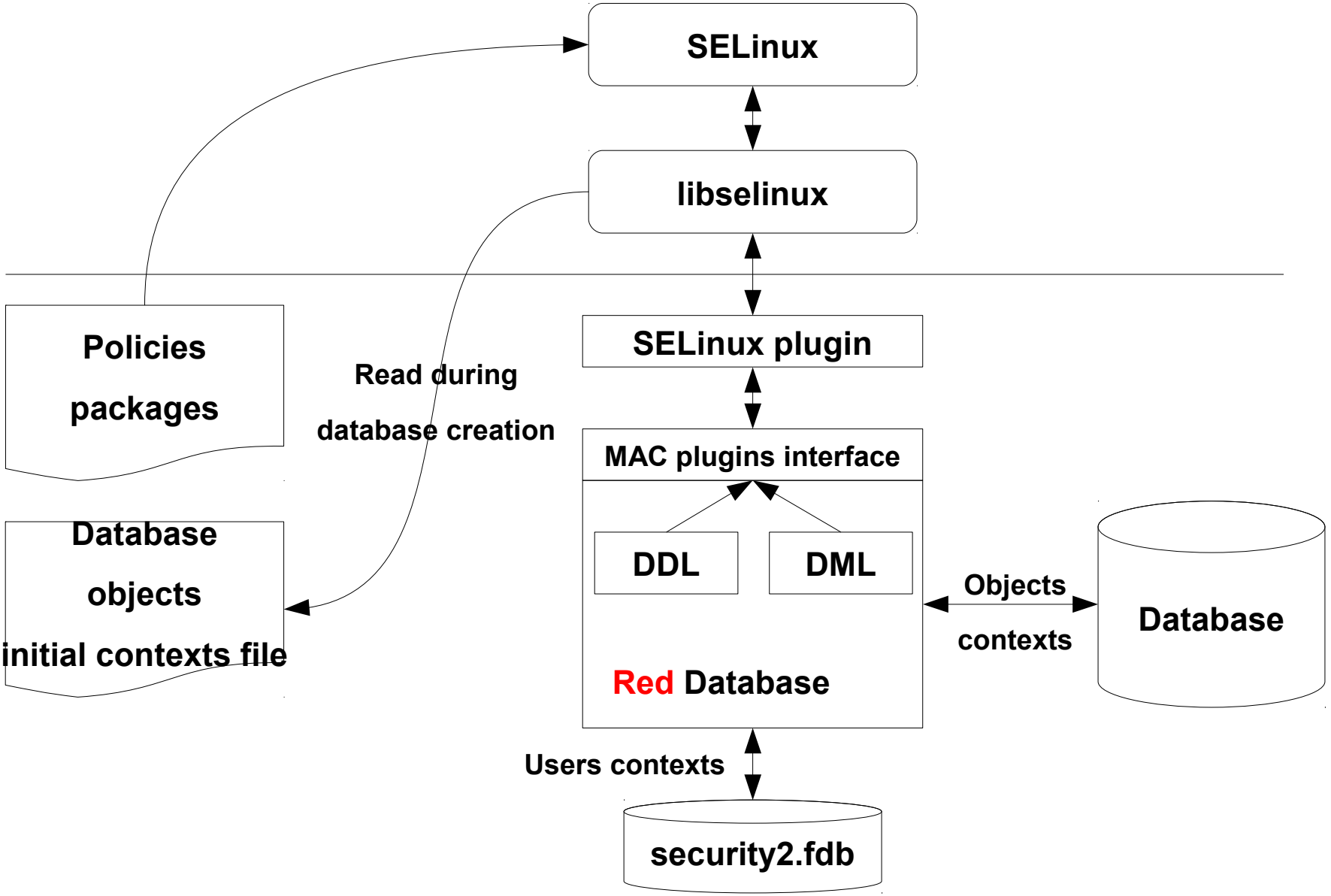
- «The best project of the state sector – 2011» (http://www.raspo.ru/content/28.html)
- AIS FSOJ of Russia was endorsed by Prime Minister of Russia in 2014 (http://government.ru/news/10513)

REDSOFT

Some words about Red Database 2.6

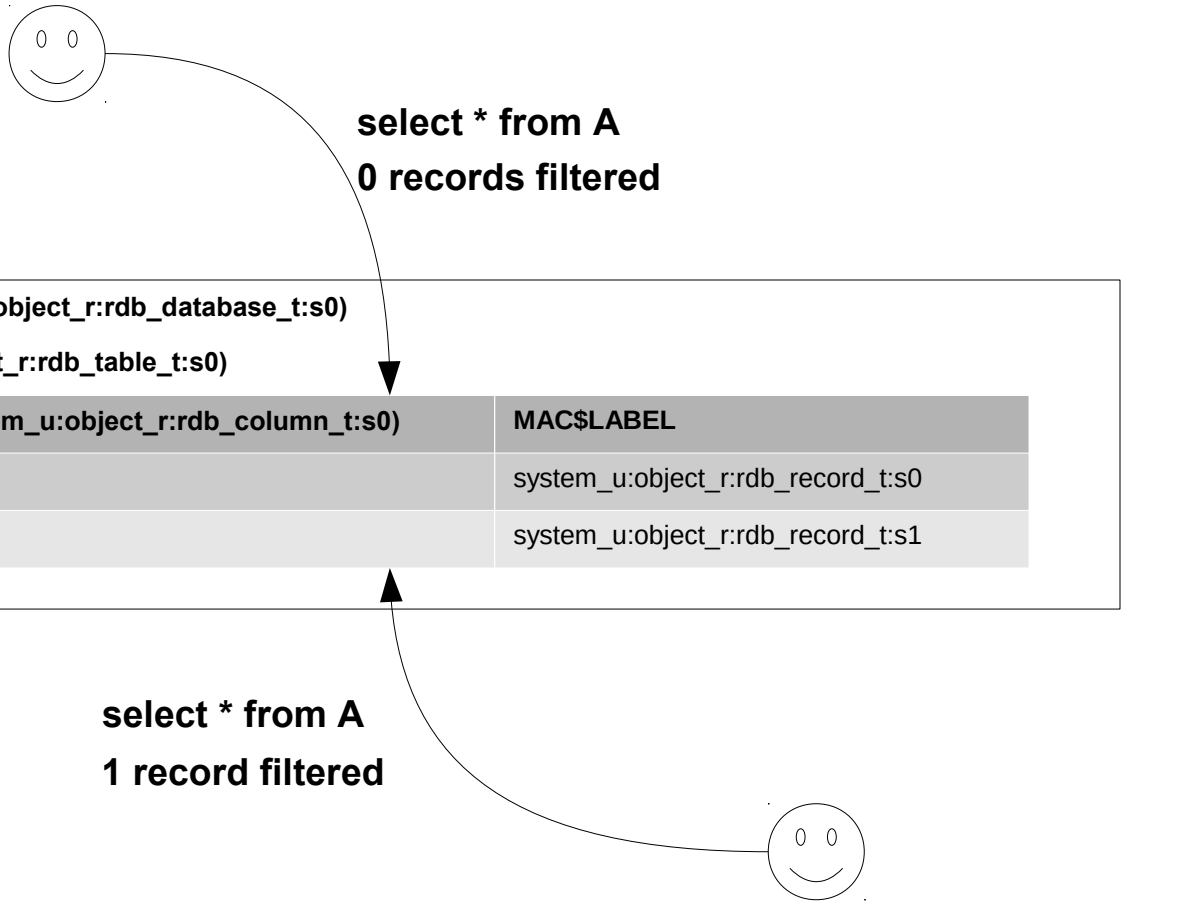
- Direction to “state secret” security level
- Mandatory access control based on SELinux integration
- Full database encryption
- Column data encryption by user key
- Traffic and backup files encryption
- Still based on Firebird 2.5

REDSOFT


SELinux
libselinux
Policies
packages
Read during
database creation
SELinux plugin
MAC plugins interface
DDL
DML
Red Database
Database
objects
initial contexts file
Objects
contexts
Database
Users contexts
security2.fdb

REDSOFT

user_a (rdb_user_u:rdb_user_r:rdb_user_t:s1)



REDSOFT

Database Encryption

Key management

```
CREATE KEY <key name> <algorithm id>
GRANT KEY <key name> TO <user name>
REVOKE KEY <key name> FROM <user name>
DROP KEY <key name>
```

Full database encryption

```
isql -mf -certificate <cert alias> [-en(crypt) <key name>]
SQL> CREATE DATABASE <db name>;
```

Column database encryption

```
isql -mf -certificate <cert alias>
SQL> CREATE TABLE <table name> (<column def> [, ENCRYPT <column name> USING
<key name>]);
SQL> ALTER TABLE <table name> ENCRYPT <column name> USING <key name>;
SQL> ALTER TABLE <table name> DECRYPT <column name>;
```

Create an encrypted backup

```
gbak [-en(crypt) <key name>]
```

REDSOFT

Some big goals of Red Database 3.0

- Merge with Firebird 3.0
- Load balancing cluster
- Parallel backup/restore
- GUI tool which support all Red Database features
- Support of OpenGIS specification
- Tools for migration from other DBMSs

REDSOFT

Thanks!

We are pleased to invite you to test Red Database!

visit: www.red-soft.biz

ask: rdb.support@red-soft.biz
roman.simakov@red-soft.biz