



**B.I.R.O.**

**Best Information through Regional Outcomes**

A European Public Health Project, DG-SANCO, 2005-2008

# R.R.D.M. System

Regional Register Diabetes Mellitus



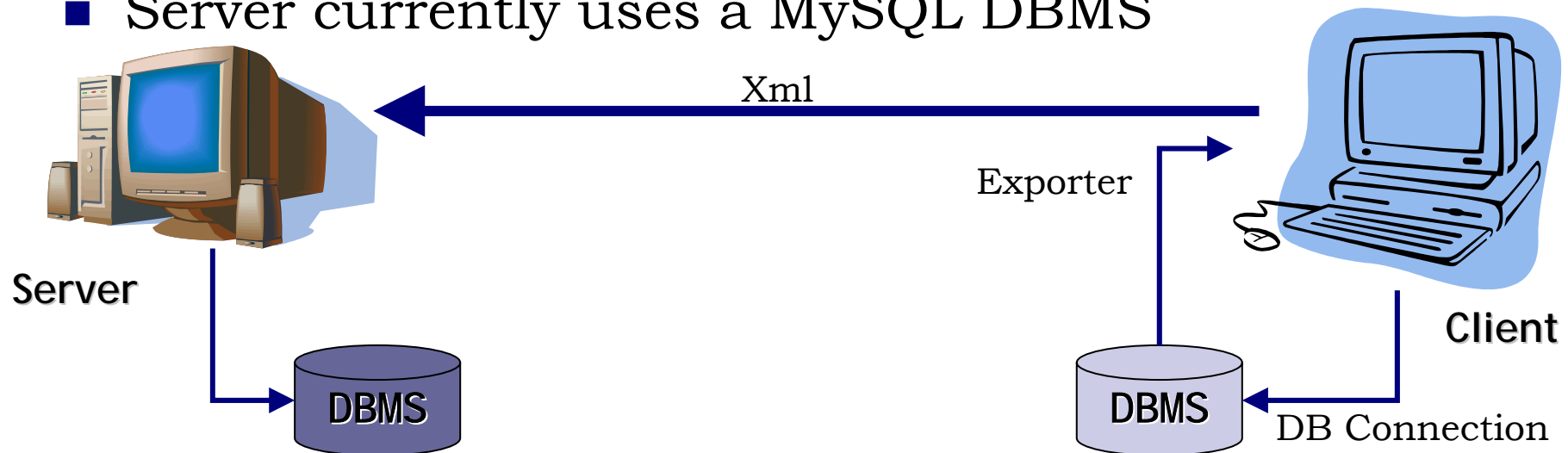
# Summary

- What is R.R.D.M. System
- Its architecture
  - Server
  - Client
    - Plug-in architecture
    - Exporter
- Protocol
- Example
- Future releases



# What is R.R.D.M. System

- R.R.D.M. System is a Java client/server tool that allows to export data from a DBMS on a client PC to another DBMS on another PC
- Client and server DBMS have neither to be necessarily the same nor have the same structure (tables and columns)
- Server currently uses a MySQL DBMS





# Electronic Medical Record Umbria Diabetes Clinics

The screenshot shows a software window titled "EuroTouch - Archivio Pazienti: Az.Dspedialiera Perugia". The interface includes a menu bar (File, Strumenti, Preferenze), a toolbar, and a search bar. The search bar contains "Trova i pazienti con Cognome" and "Uguale a", with a result count of "Trovati 12756". Below the search bar is a table with the following columns: Cognome, Nome, Codice, Data di, Sesso, Codice Servizio, Telefono, and Codice Strumento. The table contains multiple rows of patient data, with one row highlighted in blue.

Cognome	Nome	Codice	Data di	Sesso	Codice Servizio	Telefono	Codice Strumento
Pa	Adi	71	1953	M		075	
Mo	Luti	71	1937	F		075	
_a	_a		1979	M		075	
+Di	Rot	22	1967	F		076	
O.Fi	Bru	36	1924	M	00	3 075	
A	B		1964	M		1	
Abz	Ser	67	1937	M		075	
ABt	SAI	AC	1931	M	00	4 075	
Abt	Feli	60	1963	M		089	
ABE	GIU	MI	1929	M	00	22 075	
Abt	Giù	10	1932	M		075	
ABE	GU	CI	1926	M	00	2	
ABE	MAI	AC	1954	F	00	21 074	
ABE	AL		1934	M			
Abt	Lor	68	1966	M		075	
ABE	VIT	AC	1937	M	00	2 075	
ABE	KH		1945	M	S	020	
Abz	Raf	60	1948	M	00	2 075	
ABE	RAF	MI	1959	M	00	22 075	
ABE	ANT	S	1930	F	00	9 075	
Abz	Ellis	46	1940	F	00	16 075	
ABE	KAF		1939	F	00	36 347	
ABE	AMI		1971	M			
ABE	ABE		1940	M	00	63	
ACI	GIU	SC	1932	F	00	2 517	
ACI	ANI	MI	1941	F	00	083	
Acc	Mor	61	1976	F	00	57 075	
Acc	Vitti	67	1941	M		333	
ACI	MAI		1932	F	C	200 075	
ACI	MAI	SC	1930	M	00	47 075	
Acz	Pac	47	1941	F	00	67 075	
ACO	Fau	95	1941	M	00	2 075	
Acq	Ann	13	1927	F	00	3 075	
ACI	CO	S1	1922	M	00	02 075	
Acq	Ber		1961	F		075	



# Architecture (server)

- The server listens for clients' connections
- Authentication data (username and password) are needed for connection to be successful
- Different usernames have different roles (client, admin)
- Server is multi-thread, can accept many connections

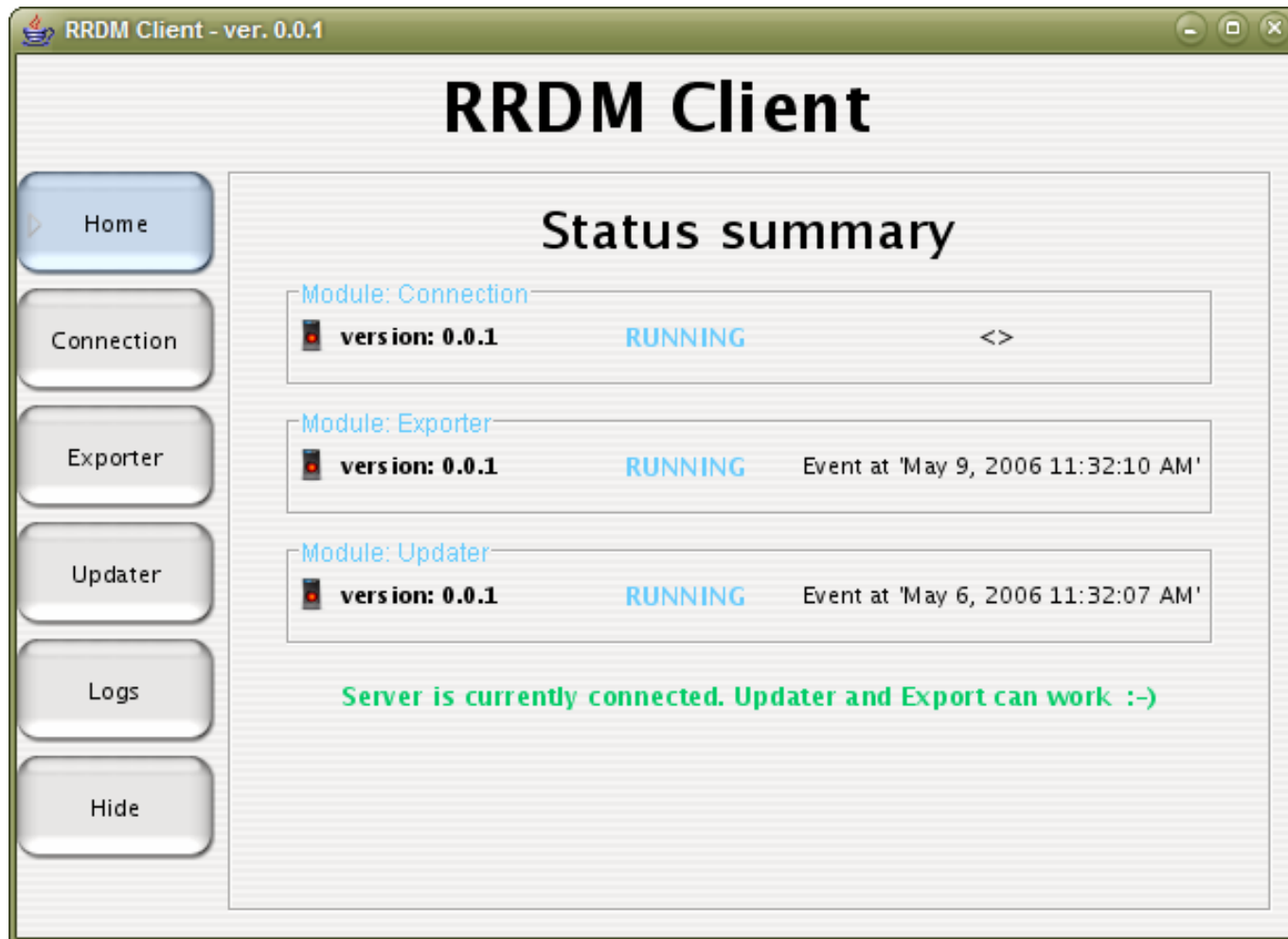


# Architecture (client)

- Client has a plug-in architecture (a plug-in is called module)
- Modules:
  - ConnectionModule: connects to server and log-in
  - UpdaterModule: checks periodically for updates, downloads and installs them as soon as found (all automatically)
  - ExporterModule: exports data from a db to server
- Is extensible with more modules
- Run in background as a Windows service (you can find a tray icon in the taskbar)
- Easily can be ported to another O.S. (the only native element is the tray icon)



# Client – Main Window



- Status of installed modules
- A separate panel for each module
- Application logs (with an implemented log-rotate tool)



# Client – Server configuration

**Server config**

Connection

Address:  :

User ID:

Password:

Module Loader

<b>Module:</b>	Connection	<input type="button" value="Start"/>
<b>State:</b>	STOPPED	<input type="button" value="Stop"/>

- Can specify address and log-in data for server connection
- This module connects to the server automatically until success or user abort





# Client – Updater configuration

**Updater config**

Check periodically

**Check every:**

Module Loader

<b>Module:</b>	Updater	<input type="button" value="Start"/>
<b>State:</b>	RUNNING	<input type="button" value="Stop"/>

- Can check at the moment or specify a date/time interval between checks



# Client – Exporter configuration

**Exporter config**

**Module config**

Database type: Microsoft SQL Server (JTDS Driver)

Exporter: EuroTouch Exporter

DB Server URL: localhost : 1433

Database name: diabetologia

User ID: sa

User password: \*\*\*\*\*

**Export Scheduler**

Next export at time: 17 May 2006 - 12:06

Repeat export every: 5 DAY

**Module Loader**

<b>Module:</b>	Exporter	Start
<b>State:</b>	STOPPED	Stop

- Can define database type (among supported\*)
- Exporter
- Database connection data
- Date and time to schedule export

\* In principle there's no limitation to supported databases, currently only Microsoft SQL Server and MySQL are implemented.



# Exporter - Intro

- The core of the system is the **Exporter**: reads data from database and exports to server
- **Exporter** is implemented with a plug-in structure, so that many **Exporter**-type can be installed and used with this tool
- One **Exporter** has been implemented, **EuroTouchExporter**.



# Exporter – Configuration

```
<?xml version="1.0" encoding="UTF-8"?>
<EuroTouchExportConfig version="0.0.1">
  <TABLE name="Anagrafica" touchKey="CodSanitario" rrdmKey="codice">
    <COLUMN name="codice" touchTable="AnagDati" touchName="CodSanitario"/>
    <COLUMN name="id_anag" touchTable="AnagDati" touchName="IdAna"/>
    <COLUMN name="name" touchTable="AnagDati" touchName="Nome"/>
    <COLUMN name="surname" touchTable="AnagDati" touchName="Cognome"/>
    <COLUMN name="genre" touchTable="AnagDati" touchName="Sesso"/>
    <COLUMN name="dateOfBirth" touchTable="AnagDati" touchName="DDN"/>
  </TABLE>
  <TABLE name="Valori" touchKey="IdAna" rrdmKey="id_anag">
    <COLUMN name="id_anag" touchTable="ValoriNumDati" touchName="IdAna"/>
    <COLUMN name="id_valori" touchTable="ValoriNumDati" touchName="IdValore"/>
    <COLUMN name="date" touchTable="ValoriNumDati" touchName="Data"/>
  </TABLE>
</EuroTouchExportConfig>
```

Tells exporter which tables and columns have to read from local database and the corresponding server tables



# Exporter – Xml Data

```
<?xml version="1.0" encoding="ISO-8859-15"?>
<DATABASE date="Wed Apr 19 12:41:23 CEST 2006">
  <TABLE name="Anagrafica" col_count="6" key="codice" size="13454">
    <DATA key="null">
      <COLUMN name="codice" value="null"/>
      <COLUMN name="id_anag" value="0"/>
      <COLUMN name="name" value="!"/>
      <COLUMN name="surname" value="!"/>
      <COLUMN name="genre" value="0"/>
      <COLUMN name="dateOfBirth" value="1900-01-01 00:00:00.0"/>
    </DATA>
    <DATA key="XXXXXXXX">
      <COLUMN name="codice" value="XXXXXXXX"/>
      <COLUMN name="id_anag" value="2"/>
      <COLUMN name="name" value="VITTORIO"/>
      <COLUMN name="surname" value="XXXXXXXX"/>
      <COLUMN name="genre" value="M"/>
      <COLUMN name="dateOfBirth" value="1927-02-24 00:00:00.0"/>
    </DATA>
    ...
  </TABLE>
</DATABASE>
```



# Exporter - Server

- Server reads exported Xml data and store them into server database according to Xml tags' name



# R.R.D.M. Features

1. Plug-in architecture:
  - More modules can be added, more exporters can be implemented
2. Client does not need to know which database the server is using
3. Many exporters can run at the same time
4. Exporter does not need to know even which database the client is using (it is configured once at top level)
5. Client and server databases do neither have to be the same, nor have the same tables structures (names or columns)!!!
  - Any already defined and implemented database can be left as it is.
6. R.R.D.M. is an auto-updating tool that does not even need any user intervention, always up to date.



# Protocol

- R.R.D.M. System uses a new implemented protocol running over TCP/IP
- Commands are transmitted between client and server by plain-text, so any simple text client, such as telnet, can connect to the server and communicate with it
- No command can be executed without authentication
- Executable commands change as role changes
- Protocol supports compressing exports data in ZIP format (all transparent to client and server) to speed up exports\*, save money and time

\* Note: plain text data can be compressed by 98% using a simple Zip compression algorithm: 54MB of data becomes only 900Kb to be transferred.





# Example (EuroTouch)

Cognome	Nome	Codice	Data d.	Sesso	Codice Servizio	Telefono
Pa	Adi	71		1953	M	075
Mo	Lufi	71		1937	F	075
_a	_a			1979	M	075
+Di	Rot	22		1967	F	076
o.F.	Bru	36		1924	M 0:	3 075
A	B			1964	M	1
Abi	Ser	87		1937	M	075
ABF	SAL	AC 3		1931	M 0:	4 075
Abt	Feli	80		1983	M	089
ABE	GIU	MI		1929	M 0:	22 075
Abt	Gi	10		1932	M	075
ABE	GIU	CI	DLO	1926	M 0:	2
ABE	MAF	AC		1954	F 0:	21 074
ABE	ALC			1934	M	
Abt	Lor	86		1966	M	075
ABE	VIT	AC	1	1937	M 0:	2 075
ABE	KHI			1945	M S'	020
Abi	Raf	80		1948	M 0:	2 075
ABE	RAF	MI		1959	M 0:	22 075
ABE	ANT	S'		1930	F 0:	9 075
Abc	Elis	46		1940	F 0:	16 075
ABE	KAF			1939	F 0:	36 347
ABE	AMI			1971	M	
ABE	ABE			1940	M 0:	63
ACI	GIU	SC		1932	F 0:	2 517
ACI	ANI	MI		1941	F 0:	083
Acc	Mor	61		1976	F 0:	57 075
Acc	VIT	87		1941	M	333
ACI	MAF			1932	F C	20 075
ACI	MAF	SC		1930	M 0:	47 075
Acc	Par	47		1941	F 0:	67 075
Acc	Fau	96		1941	M 0:	2 075
Acc	Ant	11		1927	F 0:	3 075
ACI	CO	81		1922	M 0:	02 075
Acc	Ber			1961	F	075
Acc	...	...		...	...	...

## QueryEuroTouch

Surname	Name	Description	Value	RangeMin	RangeMax
BA		Glicemia a digiuno	140	60	110
BE		Glicemia a digiuno	124	60	110
BI		Glicemia a digiuno	144	60	110
Bi		Glicemia a digiuno	222	60	110
BI		Glicemia a digiuno	342	60	110
BF		Glicemia a digiuno	139	60	110
CA		Glicemia a digiuno	235	60	110
Cic		Glicemia a digiuno	101	60	110

EuroTouch original data and a small reports of some of them

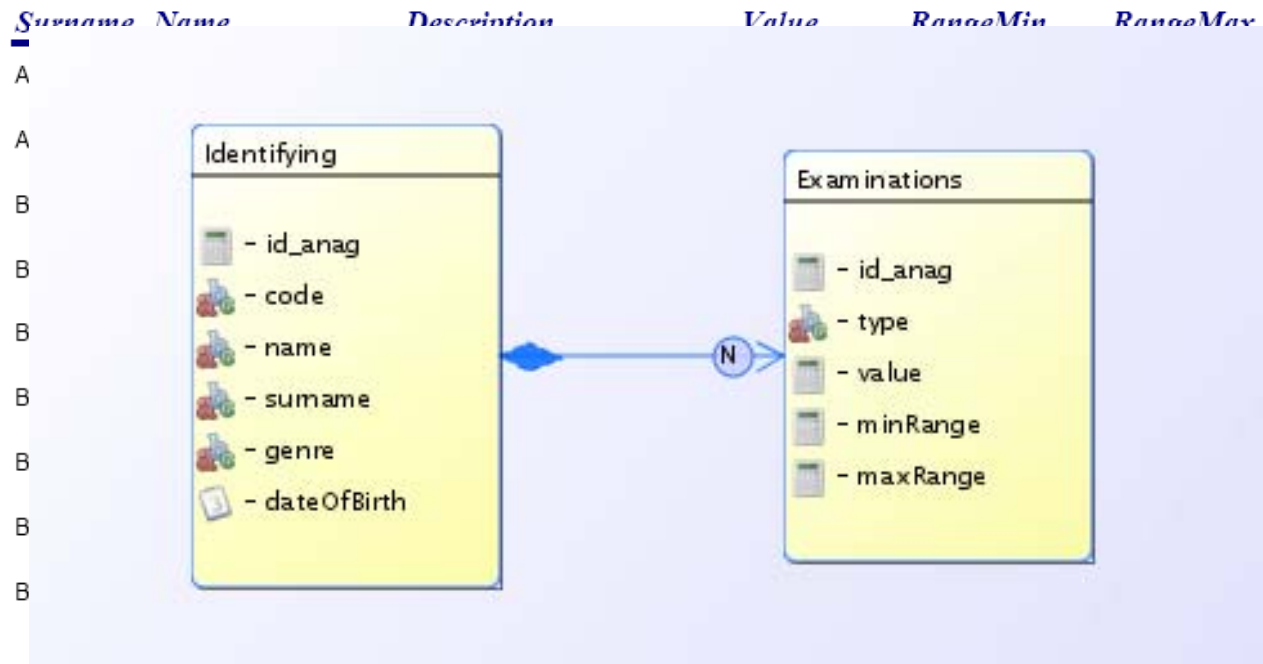


# Example (R.R.D.M.)

- After automatic export to R.R.D.M. we have all data into a MySQL Database
- We can build a new report of the same data based, this time, on R.R.D.M.
- Data from

QueryMySQL

- It
- Tε





# Limitations of R.R.D.M.

- Still beta version
- Only full-export is supported
  - First deletes old exported data, then stores new one
- Server import (due to search, delete and store) is slow and must be improved
- Management of data linkage from multiple databases not implemented



# Future Releases

- Future releases will have the following features:
- Client:
  - More supported DBMS (at least PostgreSQL and Hypersonic SQL)
  - More exporters
  - Encrypting/Decrypting add-on to used protocol\*
  - Data-linkage with regional administrative data
  - Linux support with a tray-icon for KDE/Gnome
- Server:
  - Admin tool to manage server status (commands are already implemented, it lacks of a graphical user interface)

\*) Will be implemented using a private/public key algorithm to generate keys and maybe IDEA or 3-DES for encryption