WEB SERVICES

TECHNOLOGY & DATABASE INTEROPERABILITY FOR MOUSE RESOURCES

WHAT'S OUT THERE

- **32** relational database projects were spotted
- **4** different RDBMSs (MySQL, PostgreSQL, ORACLE & DB2)
- (Probably) **32** different development strategies & technologies
- **1** model: **THE MOUSE**
- **1** problem: **INTEROPERABILITY**

for a full list of resources visit the MUGEN Mice Database @ www.mugen-noe.org/database

(WHAT IS) INTEROPERABILITY

”The capability to communicate, execute programs, or transfer data among various functional units in a manner that requires the user to have little or no knowledge of the unique characteristics of those units“

-Information Technology Vocabulary, Fundamental Terms

In our case replace ‘*functional units’* with **databases** & ‘*users’* with **developers**.

Also note that ‘*unique characteristics*’ refers to technical unique characteristics.

DB CONNECTIVITY (SO FAR)

- **Hyperlinks & Web Form Querying**
- **BioMart**
- **Web Services**
- **…MOBY**

Hyperlinks & Web Form Querying

The easiest way to provide access to other (on-line) databases:

- Hyperlinks

  (i.e. click here to visit…)

- Web form querying

  (involves web forms located in other websites/db front-ends)

A typical example is the **MMdb**, currently providing direct links to:

MGI | Ensembl | ArrayExpress | Entrez | Eurexpress | EMMA | JAX

In the context of the '***one-stop-shop***' rationale and attempting to provide as much information as possible within a '***max three click away***' limit, hyperlinks & web form querying provide **sufficient** interconnectivity.
DB interoperability – **ACTUAL DATA FLOW** - requires more than simple forwarding to other pages. We need **direct**, **dynamic** and on **request** data transfer technology.

BioMart

BioMart is an **advanced data management system** that has been integrated across multiple institutional sites with variable species coverage. It is incredibly well developed and documented and is fully integrated into the **Ensembl** genome browser.

The **good** points:

- The database can be included in BioMart's central project page and can be queried directly from there.
- Utilizing MartView the database can bear a nice web interface.
- Utilizing MartService web services are automatically installed.

The **weak** points:

- Currently BioMart supports only MySQL, PostgreSQL & Oracle.
- MartView & MartService need Apache web server installation.
- Can MartView absorb unlimited web services from other databases?

Web Services

Web Services are a *"software system designed to support interoperability between information systems over a network."*

Technically speaking web services are *SOAP* standard *XML* over *HTTP*.

The **good** news:

- Web Services do not depend on the RDMS and the schema of a database.
- Web Services are not dependant on the front-end's programming language.
- Web Services can be freely and easily absorbed by other databases.

One **minor drawback**:

- Web Services have to be developed for **every single** database.

Web Services & Mouse Resources

Why Web Services seem to be the reasonable choice:

- Our resource index includes dbs that are built on DB2. BioMart does not support DB2. Web Services do not depend on the RDBMS.
- Web Services provide access to XML ‘shaped’ data that can be processed, handled, imported…by **ANY** programming language.
- Web Services do not require a specific web server to be installed on your (physical) server.
- Web Services can allow data flow between **ALL** database projects.

A Web Service Client Example

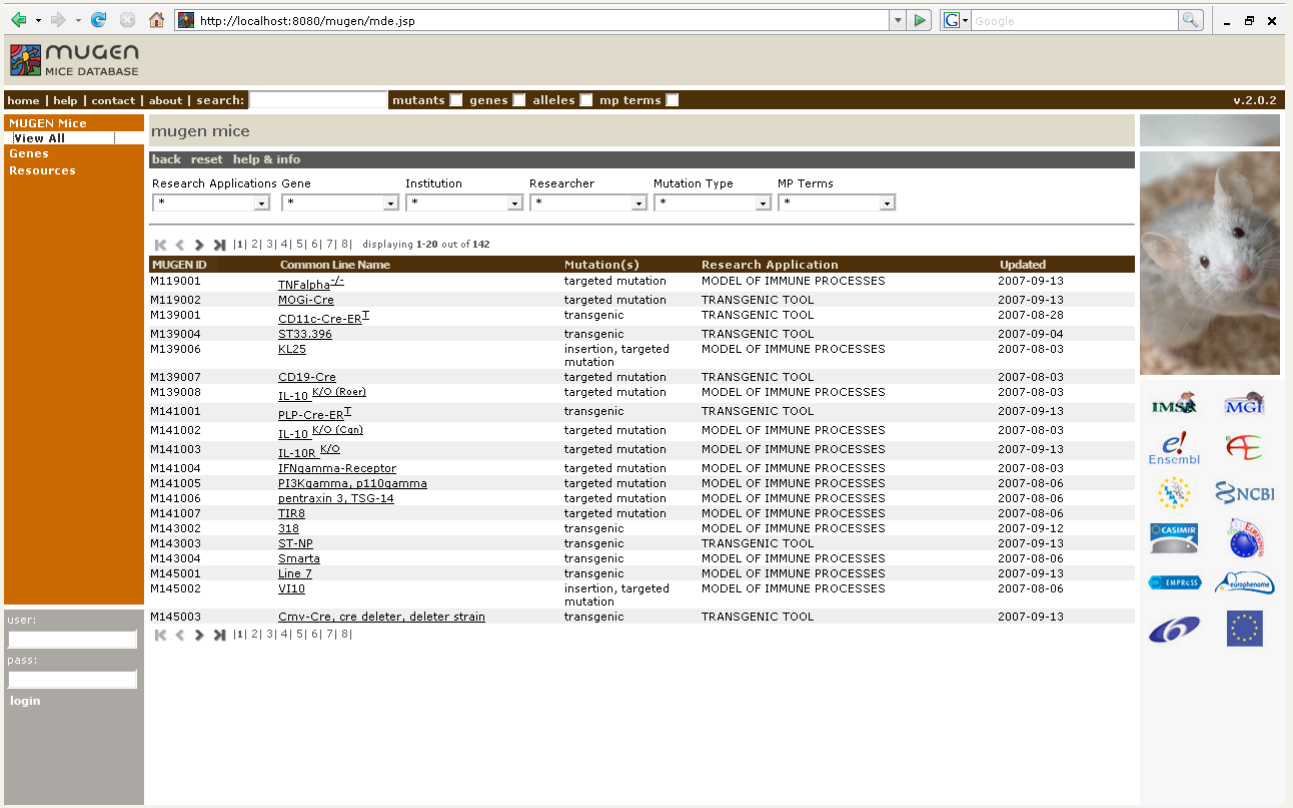
Currently we have two projects running: **MMdb** & **TgDb**.

MMdb is a virtual mouse repository.

It's being **heavily** curated by our curation team and features:

- availability,
- genotypic and
- phenotypic data

for mouse models.



visit @ www.mugen-noe.org/database

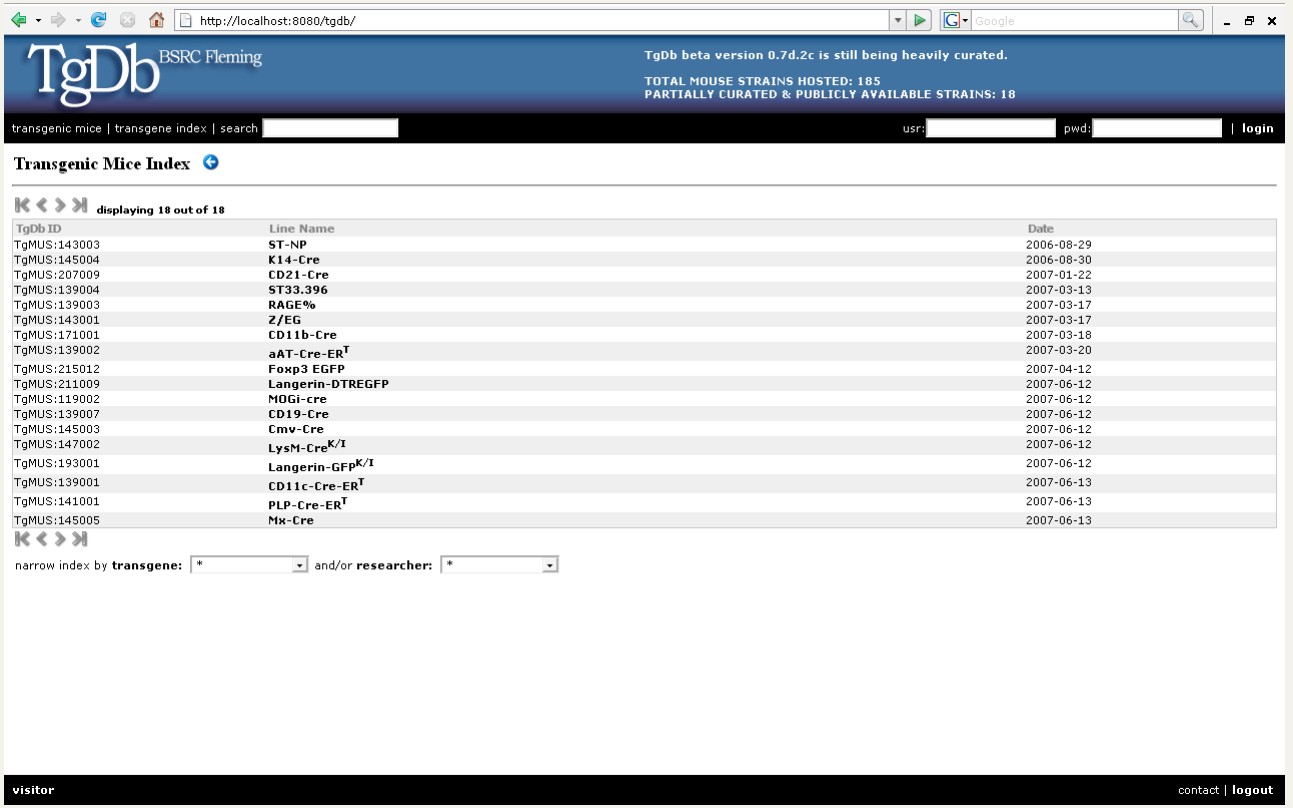
A Web Service Client Example

TgDb is also a virtual mouse repository, but focusing on transgenic mutants.

It's still being actively developed & curated.

Some key features:

- availability,
- genotypic and
- anatomy data.



visit @ www.fleming.gr/tgdb

A Web Service Client Example

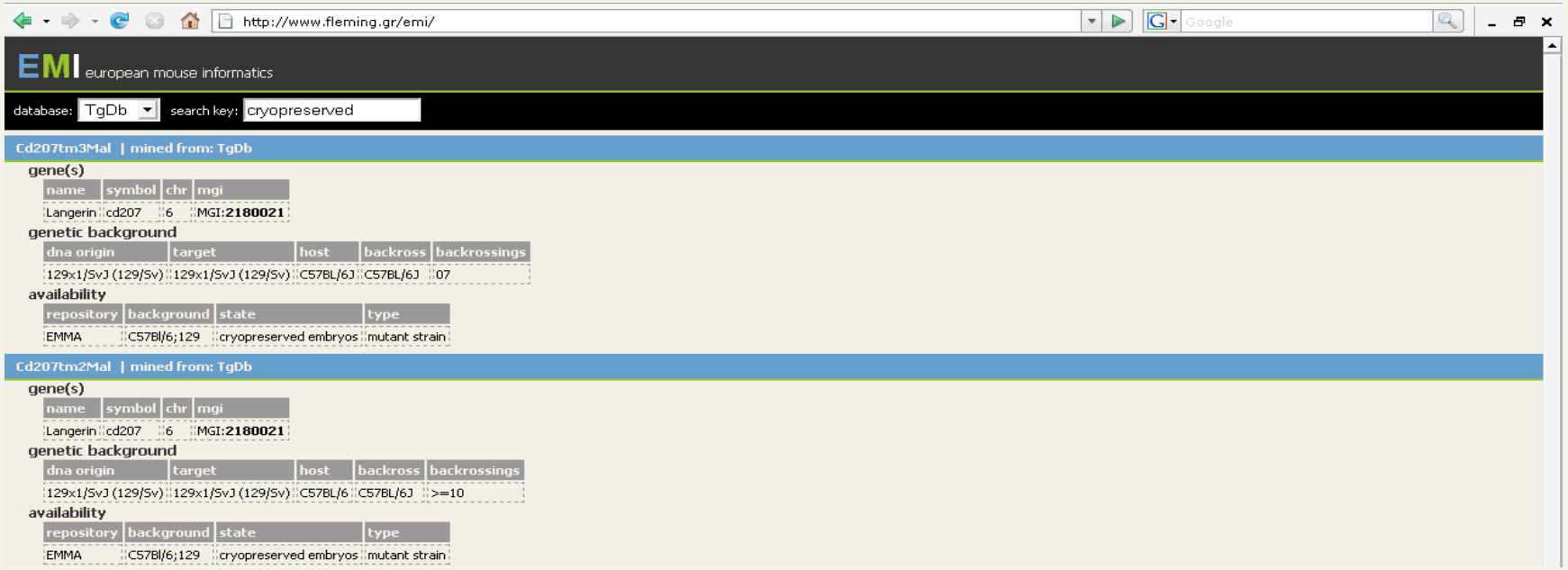
We are developing Web Services for both projects. In fact we have completed the core for both Services, so naturally we have deployed a little Web Service client project to absorb the two Web Services for testing and demonstrational purposes.

This client was called **EMI** (European Mouse Informatics) and just like our two main projects, it is **mouse centric virtual repository**.

EMI is not the front-end of a relational database. It is a simple web application that handles data representation for both MMdb & TgDb.

What is important to note is that MMdb & TgDb have significant differences in their schemas. EMI is overcoming this issue as it handles raw data fed from the two Web Services. Whatever field is provided via a Web Service is displayed.

A Web Service Client Example



The current screenshot is querying TgDb for ‘cryopreserved’. Strain, genes, genetic background, availability and phenotypic information can be displayed and queried.

EMI can be found @ www.fleming.gr/emi

The Bigger Picture

CASIMIR's WP7 has compiled an impressive resource list which involves remarkable database projects that approach the mouse model from a different perspective (virtual mouse repositories, phenotype and anatomy projects, mouse genome projects etc.).

The biggest challenge yet is to integrate those resources in a '**one-stop-shop**'.

Considering the fact that many mouse resource projects have already implemented Web Services and the benefits of utilizing this technology, we can only encourage further Web Service development in order to …

The Ultimate Goal

…to achieve the ultimate goal;
the launch of a project that will absorb all relevant available Web Services, and will provide:

- A useful and easy to use interface, providing an all-embracing view/dataset of the mouse model.
- A combinatorial optimization platform for mouse model data, paving the way towards systems biology.