

Introduction to MySQL

Database Systems
Presented by Rubi Boim

Agenda

- × Bureaucracy...
- × Database architecture overview
- × Buzzwords
- × SSH Tunneling
- × Intro to MySQL
- × Comments on homework

Homework #1

- ✗ Submission date is November 29. (No late arrivals will be accepted)
- ✗ Work should be done in pairs
- ✗ Please, please, please, names and ID on the submittals.
- ✗ Submit Hardcopies to Rubi's mailbox
- ✗ USE THE FORMAT DESCRIBED IN THE ASSIGNMENT

Project

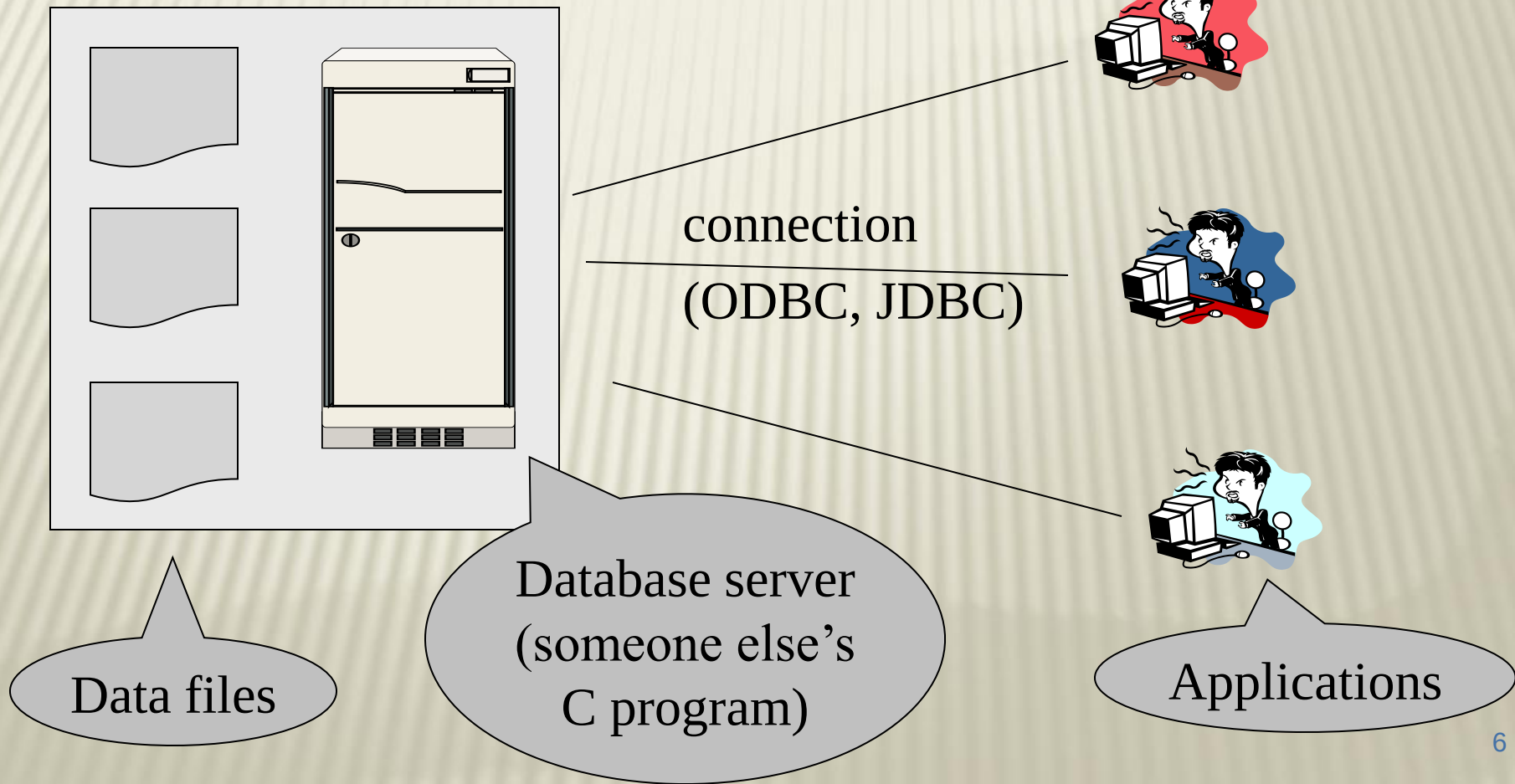
- × Hard work, but real.
- × Work in groups of 4
- × Project goal: to tackle and resolve **real-life** DB related development issues
- × ~~One Two~~ stages.
- × Use JAVA (SWT)
- × Thinking out of the box will be rewarded

Agenda

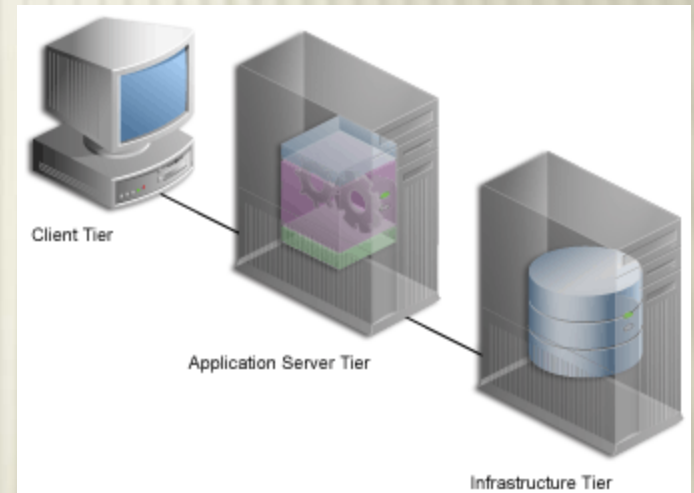
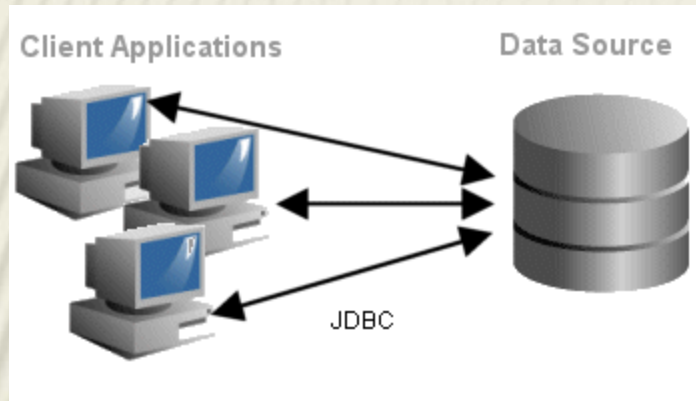
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DB System from lecture #1

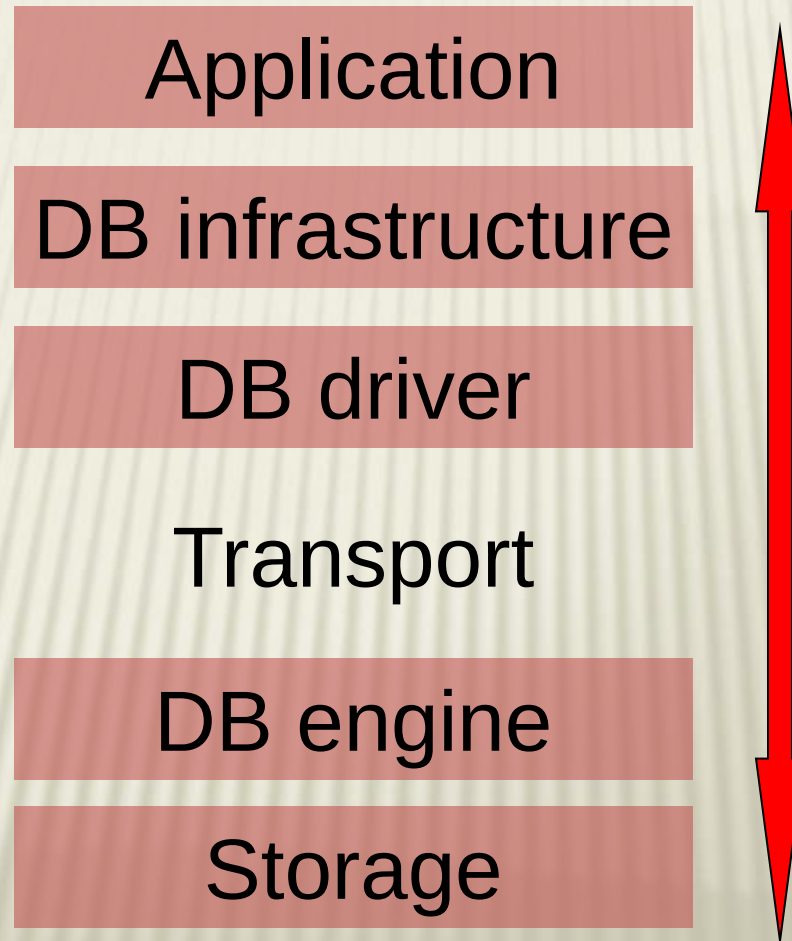
“Two tier database system”



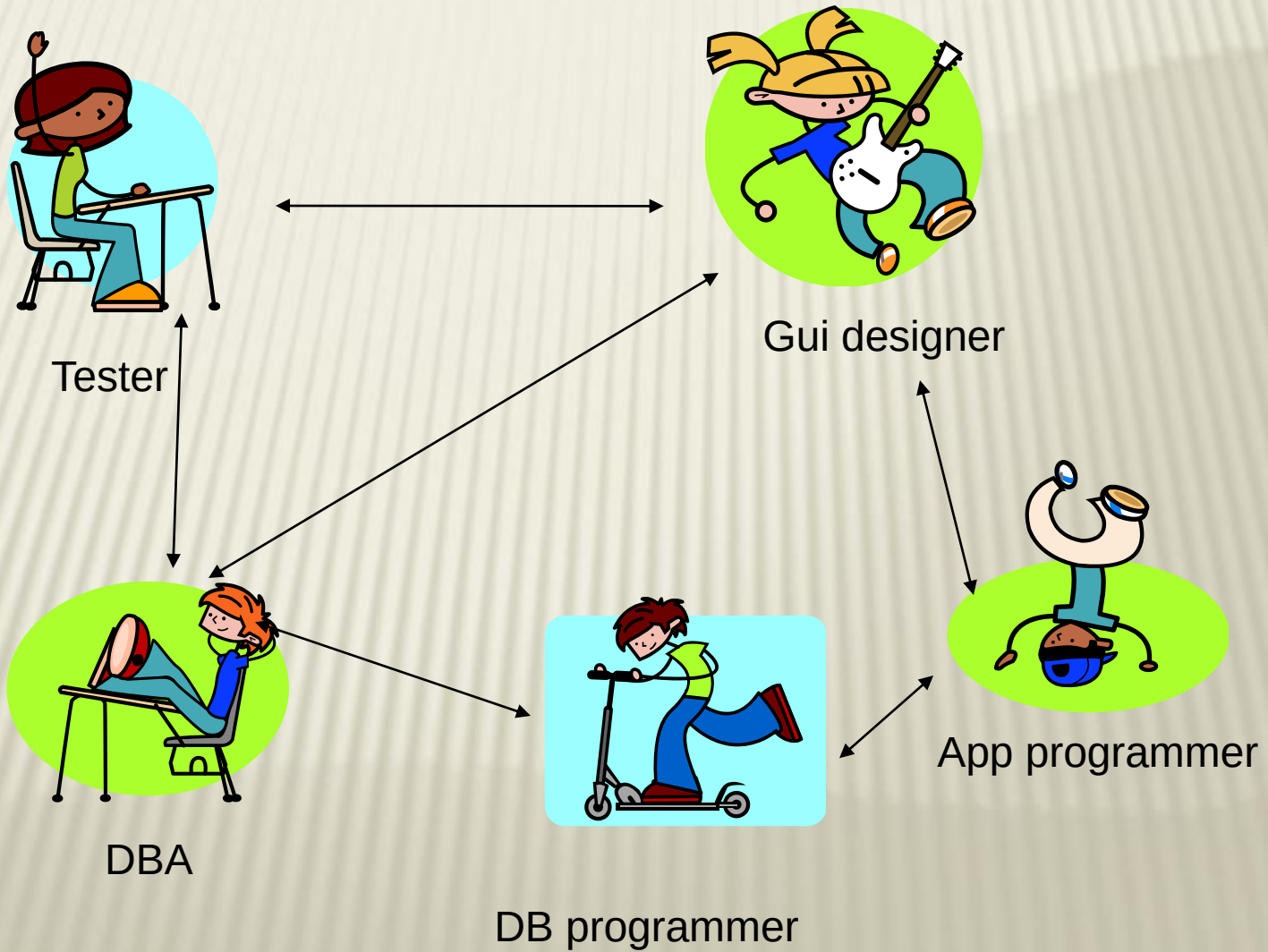
1,2,3 tiers



Abstractly (DB) system layers may include

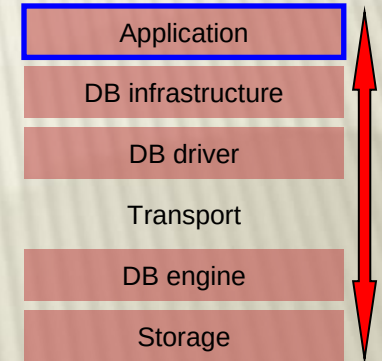


Why?



Application layer

- ✖ Why should it actually use database?
 - + Persistence layer
 - + Access data storage
 - + Interfacing between systems
 - + Large volumes
 - + Scalability
 - + Redundancy

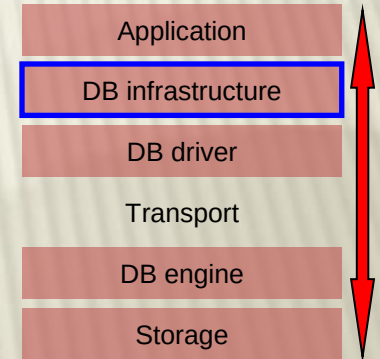


Infrastructure layer

× Goals:

- + Database “hiding”
- + Schema abstraction
- + Encapsulation of db mechanisms

× How: (In two words)



Model Abstraction

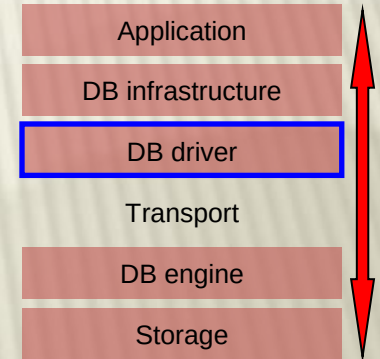
DB driver / bridge

× Used for:

- + API for database connectivity
- + Protocol converter
- + Performance improvements
- + Transaction management

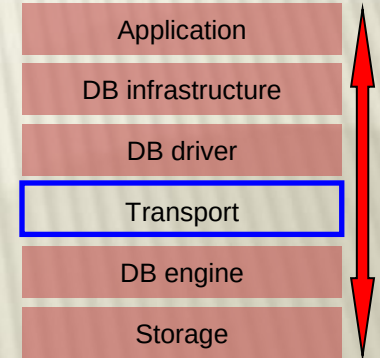
× Examples:

- + In a minute...



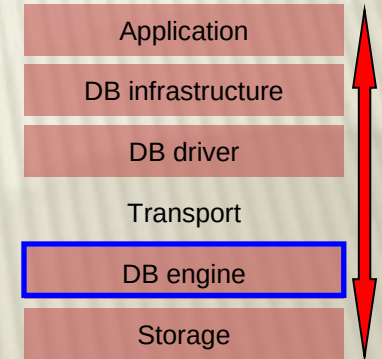
Transport

- ✖ Mainly TCP but not only
- ✖ Secure
- ✖ Efficient
- ✖ Fast but not fast enough



DB engine

- ✖ Total management of the DB environment including
 - + Security
 - + Scalability
 - + Fault tolerant (disaster management)
 - + Monitoring
 - + Services
- ✖ Large DB engines include Microsoft SQL Server, Oracle, SyBase, MySQL, etc.



DB engine (2)

DB engine management includes:

- + Databases/Tables/Fields

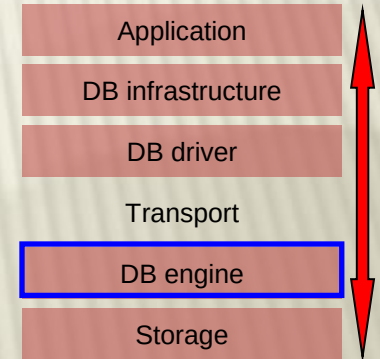
Creation/removal/modification/
optimization

- + Connections/Users/Roles

Security/monitoring/logging

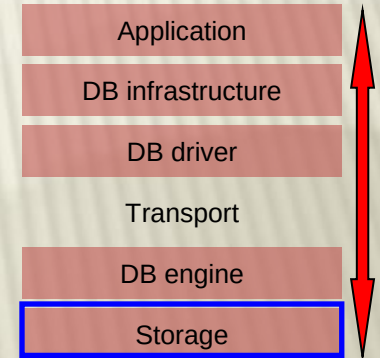
- + Jobs/Processes/Threads

Scheduling/balancing/managing



Storage

× NAS/SAN, Raid and other stuff...
(sorry... not in this course)



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Terms...

- × ODBC
- × ADO
- × OLE-DB
- × MDAC/UDA
- × JDBC
- × ORM

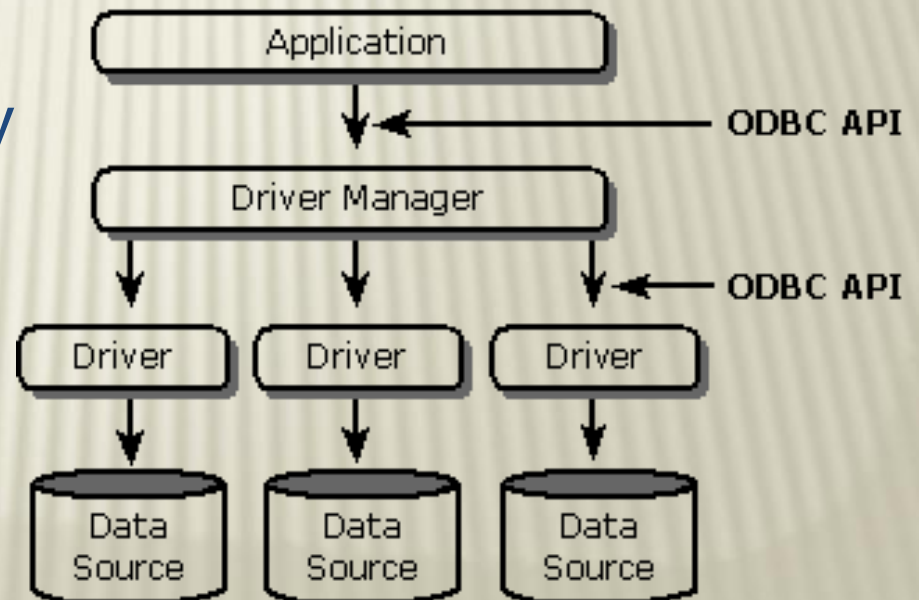
ODBC, OLEDB and ADO

- × Various standards have been developed for accessing database servers.
- × Some of the important standards are
 - + **ODBC** (Open Database Connectivity) is the early standard for relational databases.
 - + **OLE DB** is Microsoft's object-oriented interface for relational and other databases.
 - + **ADO** (Active Data Objects) is Microsoft's standard providing easier access to OLE DB data for the non-object-oriented programmer.

ODBC

- ✧ Open Database Connectivity (ODBC) is a standard software API method for using database management systems (DBMS)

- ✧ Maximum interoperability



ODBC

Examples of common tasks:

- + Selecting a data source and connecting to it.
- + Submitting an SQL statement for execution.
- + Retrieving results (if any).
- + Processing errors.
- + Committing or rolling back the transaction enclosing the SQL statement.
- + Disconnecting from the data source.

MDAC... UDA

- × UDA (Universal Data Access) and/or MDAC (Microsoft Data Access Components) include (ADO), OLE DB, and (ODBC).

JDBC

- × Java DB connectivity API
- × Similar to ODBC
- × Why do you need it:
 - + Pure Java
 - + Simple API
 - + Well....Multi-platform

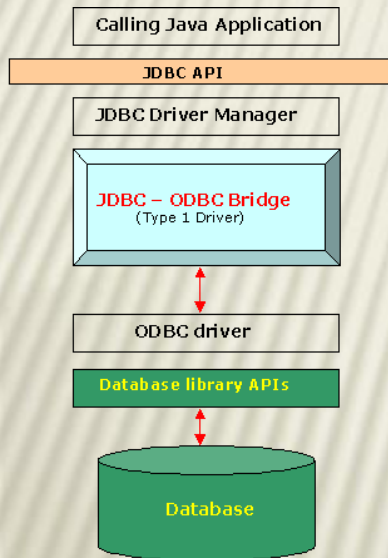
JDBC

- × API includes:
 - + DriverManager, Connection, Statement, PreparedStatement, CallableStatement, ResultSet, SQLException, DataSource

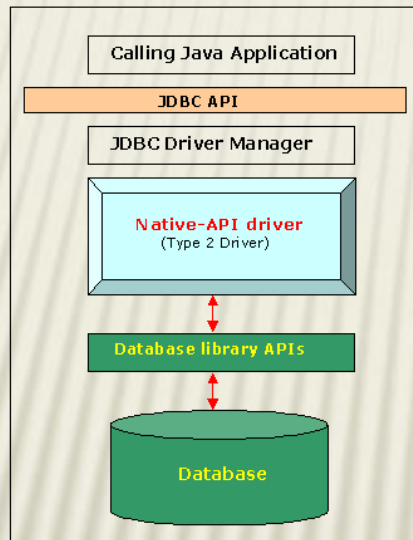
- × JDBC Type Driver:
 - + **Type 1** - (JDBC-ODBC Bridge) drivers.
 - + **Type 2** - native API for data access which provide Java wrapper classes
 - + **Type 3** - 100% Java, makes use of a middle-tier between the calling program and the database..
 - + **Type 4** - They are also written in 100% Java and are the most efficient among all driver types. Calls directly into the vendor-specific database protocol.

JDBC Types

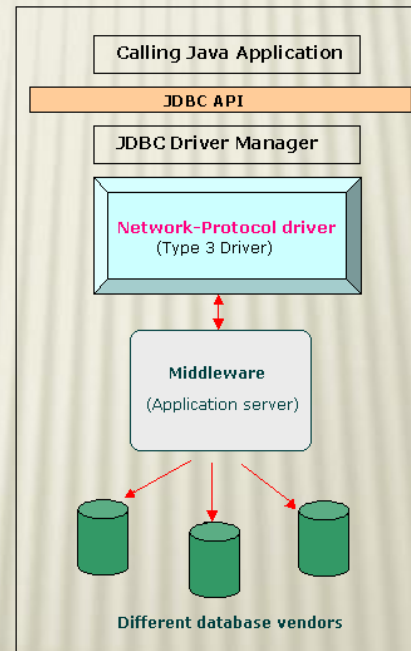
Type 1



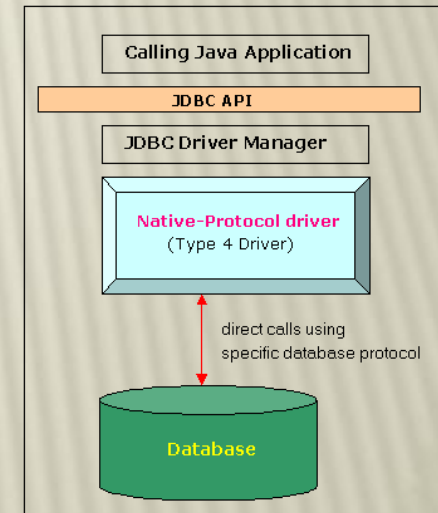
Type 2



Type 3



Type 4



ORM

- × **Object-Relational mapping** is a programming technique for converting data between incompatible type systems in relational databases and object-oriented programming languages.
- × For example: Hibernate

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Connecting...

You need:

- × **IP**

- × **Port**

× Home install:	IP=localhost
TAU's server:	IP=mysqlsrv.cs.tau.ac.il

- × MySQL default port is 3306

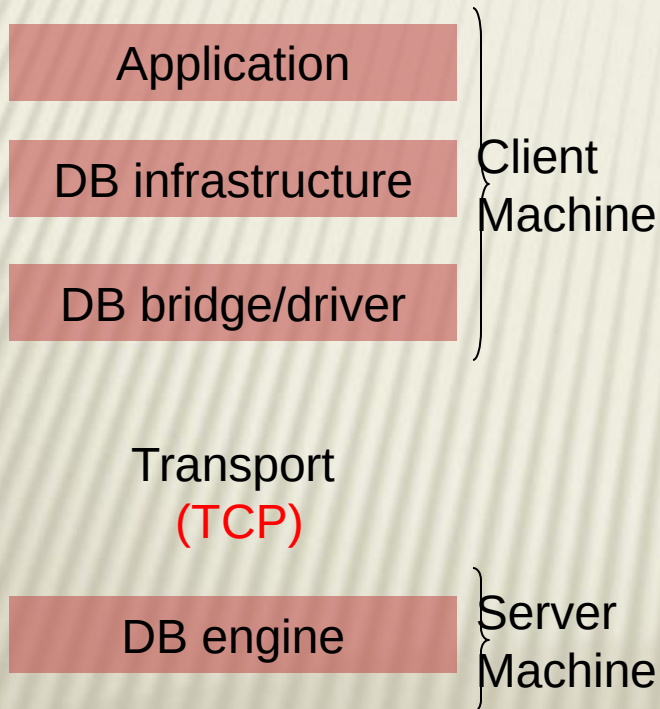
is it really that easy??

Welcome to

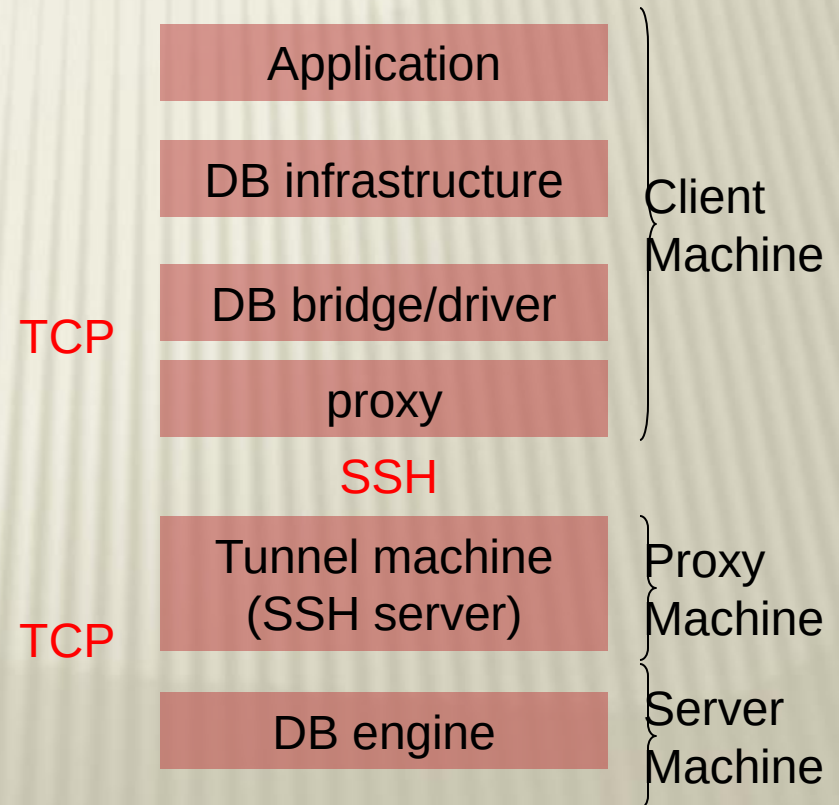
The travels of a queen

SSH

Standard way



Using Tunnel



SSH in TAU

Application

DB infrastructure

Db bridge/driver

proxy

YOUR MACHINE
define DB at localhost, port 3305

Putty connects to nova and
forward local port 3305 to
mysqlsrv.cs.tau.ac.il port 3306

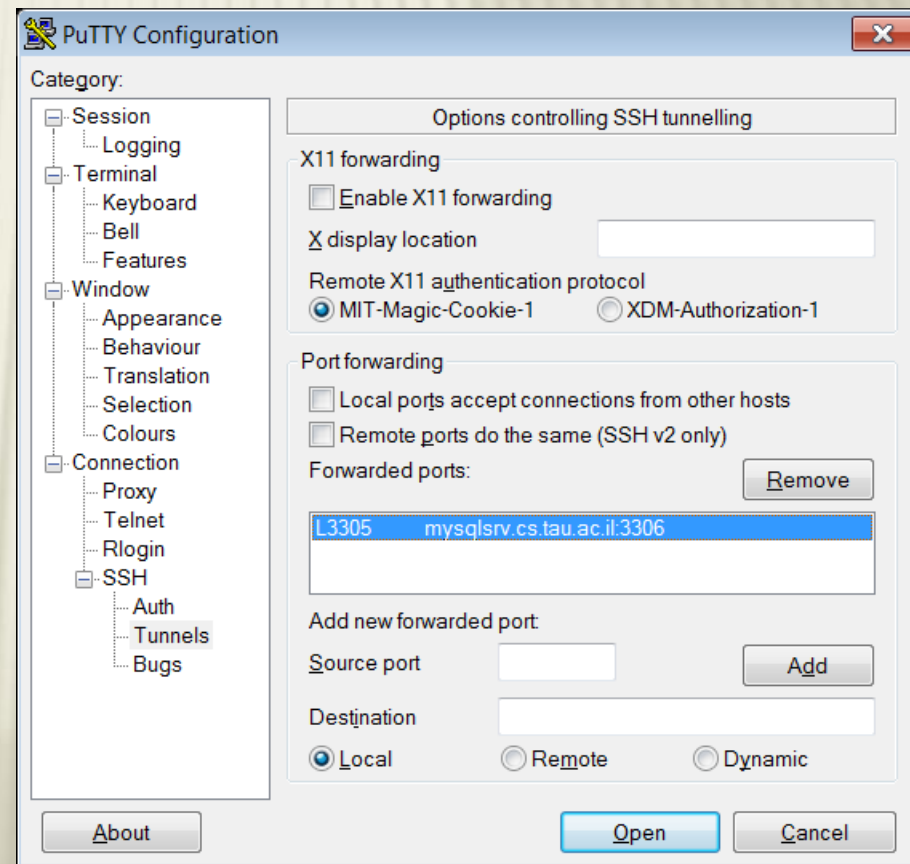
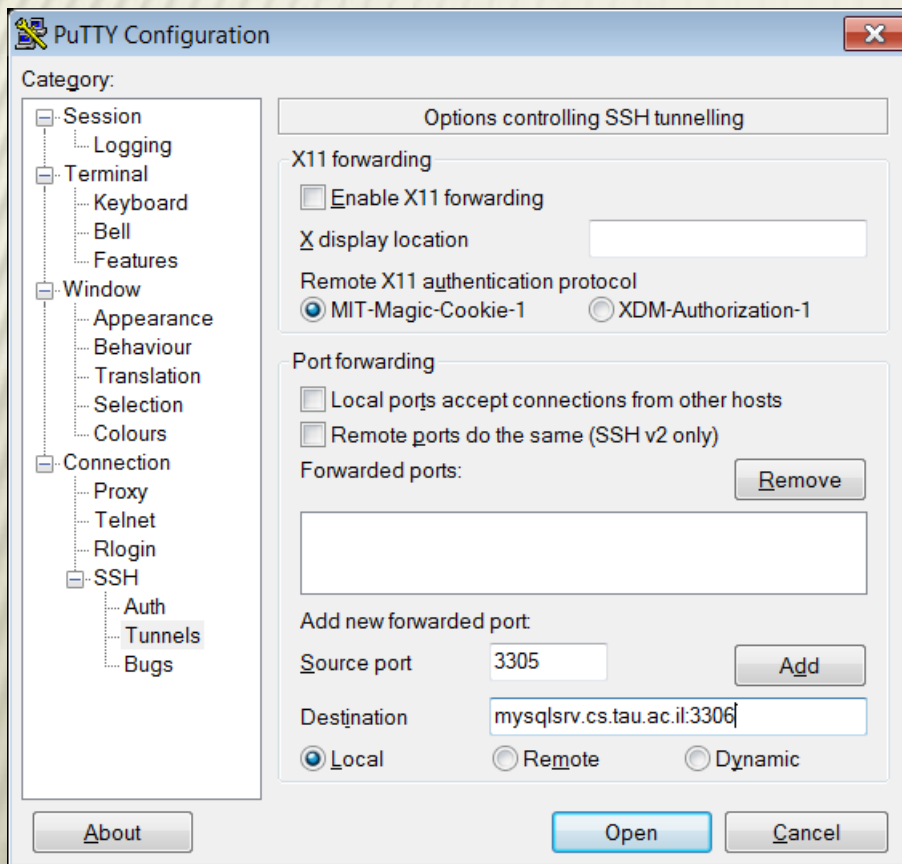
Tunnel machine
(SSH server)

DB engine

Nova.cs.tau.ac.il

SSH in TAU

× Putty



Don't forget to

- × CHECK THE CONNECTION GUIDE!!
(course website)

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Products we will be using

- × MySQL (Community Server – Home)
- × MySQL (Enterprise Edition – TAU)
- × MySQL Workbench (GUI Tool..)
- × MySQL Connector (J) – In two weeks...

Free to download on www.mysql.com



TAU Server settings..

- ✖ You can create your own user (schema) by following the connection guide link (course website..)
- ✖ For the project, each group will get a ``special'' user (schema)

“Sakila” Schema (For hw1)

- ✕ We will use the “Sakila” schema

<http://dev.mysql.com/doc/sakila/en/sakila.html>

- ✕ Install and download from

<http://dev.mysql.com/doc/index-other.html>

- ✕ Already installed on TAU’s server:

username: *sakila*

password: *sakila*

schema: *sakila*

MySQL Command

× How to run:

<http://www.cs.tau.ac.il/system/faq/development/databases/mysql2>

→ `mysql -u sakila -h mysqlsrv.cs.tau.ac.il sakila -p`

× Common commands:

- “show databases;”
- “show tables;”
- “select.. ;”

→ Don't forget the ;

Install MySQL at Home

- × MySQL Community Server

<http://www.mysql.com/downloads/mysql/>

- × MySQL Workbench

<http://www.mysql.com/downloads/workbench/>

- × (You might need to download Microsoft Visual C++ 2010 Redistributable Package)

(32bit) <http://www.microsoft.com/download/en/details.aspx?id=5555>

(64bit) <http://www.microsoft.com/download/en/details.aspx?id=14632>

MySQL Workbench

Installation only at home...

Demo Time ☺

DEMO TIME ☺

- × Startup the Server..

Demo Time ☺

- × Server Administration
 - run the local instance
 - create users
 - export/import

Demo Time 😊

- × SQL Development
 - browse the schema
 - create/alter tables
 - run queries
 - export results

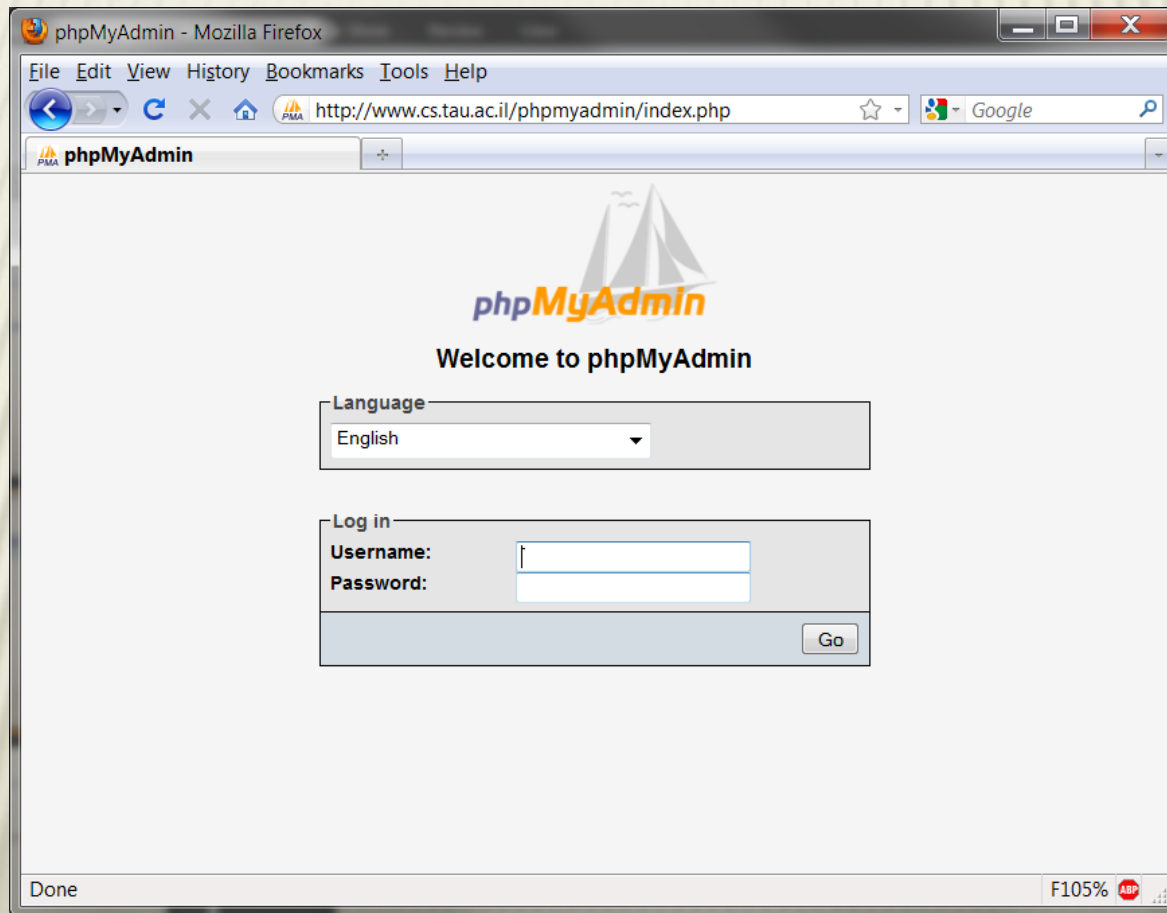
Demo Time ☺

- × Install the “sakila” schema

Demo Time ☺

- × Data Modeling
 - browse / alter the schema

phpMyAdmin



phpMyAdmin

- × Another tool for managing MySQL
- × Installed on tau, and reachable from home without a tunnel!

<http://www.cs.tau.ac.il/phpmyadmin/index.php>

- × To install at home, download from:
<http://www.phpmyadmin.net/>
(requires php server so its not recommended unless you are familiar with these stuff...)

phpMyAdmin

Database

sakila (23)

sakila (23)

- actor
- actor_info
- address
- category
- city
- country
- customer
- customer_list
- film
- film_actor
- film_category
- film_list
- film_text
- inventory
- language
- nicer_but_slower_film_list
- payment
- rental
- sales_by_film_category
- sales_by_store
- staff
- staff_list
- store

Server: mysqlsrv.cs.tau.ac.il Database: sakila

Structure SQL Search Query Export Import Operations

Table	Action	Records ¹	Type	Collation	Size	Overhead
☐ actor	      	200	InnoDB	utf8_general_ci	32.0 KiB	-
☐ actor_info	      	~0 ²	View	---	-	-
☐ address	      	603	InnoDB	utf8_general_ci	96.0 KiB	-
☐ category	      	16	InnoDB	utf8_general_ci	16.0 KiB	-
☐ city	      	600	InnoDB	utf8_general_ci	64.0 KiB	-
☐ country	      	109	InnoDB	utf8_general_ci	16.0 KiB	-
☐ customer	      	599	InnoDB	utf8_general_ci	128.0 KiB	-
☐ customer_list	      	~0 ²	View	---	-	-
☐ film	      	1,000	InnoDB	utf8_general_ci	272.0 KiB	-
☐ film_actor	      	5,462	InnoDB	utf8_general_ci	272.0 KiB	-
☐ film_category	      	1,000	InnoDB	utf8_general_ci	80.0 KiB	-
☐ film_list	      	~0 ²	View	---	-	-
☐ film_text	      	1,000	MyISAM	utf8_general_ci	317.8 KiB	-
☐ inventory	      	4,581	InnoDB	utf8_general_ci	368.0 KiB	-
☐ language	      	6	InnoDB	utf8_general_ci	16.0 KiB	-
☐ nicer_but_slower_film_list	      	~0 ²	View	---	-	-
☐ payment	      	16,049	InnoDB	utf8_general_ci	2.1 MiB	-
☐ rental	      	16,044	InnoDB	utf8_general_ci	2.7 MiB	-
☐ sales_by_film_category	      	~0 ²	View	---	-	-
☐ sales_by_store	      	~0 ²	View	---	-	-
☐ staff	      	2	InnoDB	utf8_general_ci	96.0 KiB	-
☐ staff_list	      	~0 ²	View	---	-	-
☐ store	      	2	InnoDB	utf8_general_ci	48.0 KiB	-
23 table(s)	Sum	~47,273	MyISAM	latin1_swedish_ci	6.6 MiB	0 B

Check All / Uncheck All

With selected: ▾

Print view Data Dictionary

Create new table on database sakila

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“Sakila” Schema

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- ✕ Install and download from
<http://dev.mysql.com/doc/index-other.html>
- ✕ Already installed on TAU’s server:
username: *sakila*
password: *sakila*
schema: *sakila*

Homework Notes

- × SQL functions and arithmetic conditions.
- × 'strings'
- × LIKE (%), LOWER
- × Use the Syntax help in Query browser
- × MAX, MIN
- × IN

Thank you 😊