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Topic 7: Application Development (Ch. 9)

Database System Concepts

©Silberschatz, Korth and Sudarshan
(Modified for CS 4513)



Outline

- How our applications were using the database so far
- Developing an application to access the database through the web
- Implementing our web database application using JSP
 - What is JSP?
 - Installation Instructions Overview
 - Example Application Demo
- Implementing our web database application using PHP
 - What is JSP?
 - Installation Instructions Overview
 - Example Application Demo



Using The Database So Far

- We were connecting to our database application in two ways:
 - Azure Portal Console or Azure Data Studio IDE (homework 2)
 - ▶ Taking user's SQL queries to execute
 - Java Application connected to the database via a JDBC driver (graded homework 3)
 - ▶ Interacting with a user through a command prompt

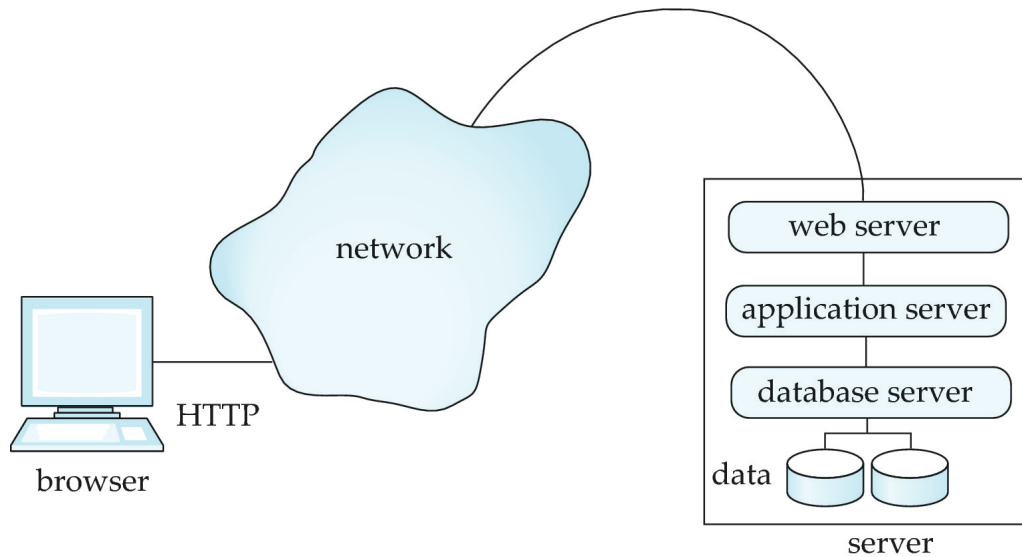


Web Database

- Most database users do *not* use a query language like SQL
- An application program acts as the intermediary between users and the database
 - Applications split into
 - ▶ front-end
 - ▶ middle layer
 - ▶ backend
- Front-end: user interface
 - Forms
 - Graphical user interfaces
 - Many interfaces are Web-based



Three-Layer Web Architecture





What is JSP?

- Java Server Pages (JSP) technology enables Web developers and designers to rapidly develop and easily maintain information-rich, dynamic Web pages that leverage existing business systems -
http://www.tutorialspoint.com/jsp/jsp_overview.htm
- As part of the Java technology family, JSP technology enables rapid development of Web-based applications that are platform-independent.
- JSP technology separates the user interface from content generation, enabling designers to change the overall page layout without altering the underlying dynamic content.



What is JSP?

A JSP page with embedded Java code:

```
<html>
<head> <title> Hello </title> </head>
<body>
<% if (request.getParameter("name") == null)
    { out.println("Hello World"); }
    else { out.println("Hello, " + request.getParameter("name")); }
%>
</body>
</html>
```



JSP Installation Overview

In order to develop a web database application using JSP we need:

- Azure SQL Database
- Eclipse IDE for Java Enterprise Developers
 - ▶ <https://www.eclipse.org/downloads/packages/>
- Apache Tomcat Web-Server
 - ▶ <https://tomcat.apache.org/download-90.cgi>
- JDBC driver for Azure SQL
 - ▶ <https://docs.microsoft.com/en-us/sql/connect/jdbc/download-microsoft-jdbc-driver-for-sql-server?view=sql-server-2017>



Example Web Application

We will use the below simple database consisting of a single table as an example. It can be used for keeping record of the guest who come to your movie nights:

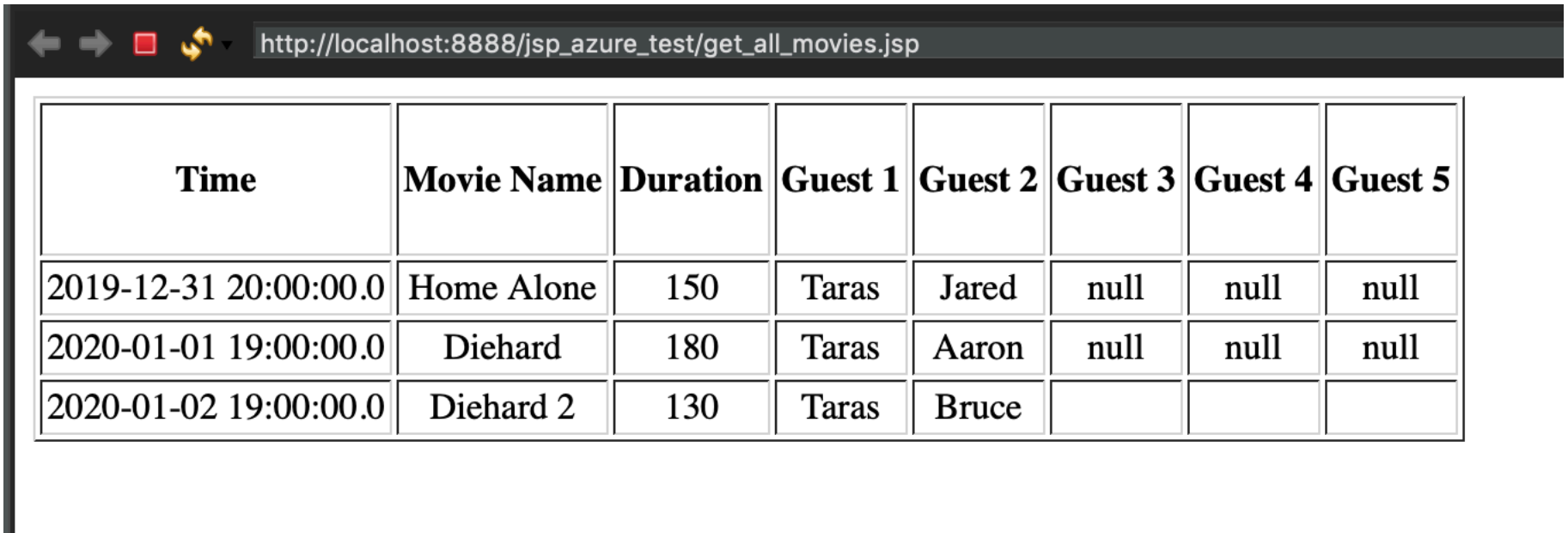
```
CREATE TABLE movie_night (  
    start_time DATETIME PRIMARY KEY,  
    movie_name VARCHAR(64),  
    duration_min INT,  
    guest_1 VARCHAR(64),  
    guest_2 VARCHAR(64),  
    guest_3 VARCHAR(64),  
    guest_4 VARCHAR(64),  
    guest_5 VARCHAR(64),  
);
```



Example Web Application

Resulting web application will consist of two web pages:

- First, to display the existing records of movie nights
- Second, to add a new movie night record



A screenshot of a web browser window. The address bar shows the URL `http://localhost:8888/jsp_azure_test/get_all_movies.jsp`. The browser displays a table with 8 columns: Time, Movie Name, Duration, Guest 1, Guest 2, Guest 3, Guest 4, and Guest 5. The table contains three rows of data.

Time	Movie Name	Duration	Guest 1	Guest 2	Guest 3	Guest 4	Guest 5
2019-12-31 20:00:00.0	Home Alone	150	Taras	Jared	null	null	null
2020-01-01 19:00:00.0	Diehard	180	Taras	Aaron	null	null	null
2020-01-02 19:00:00.0	Diehard 2	130	Taras	Bruce			



Example Web Application

Resulting web application will consist of two web pages:

- First, to display the existing records of movie nights
- Second, to add a new movie night record

The screenshot shows a web browser window with the address bar displaying `http://localhost:8888/jsp_azure_test/add_movie_form.jsp`. The page title is "Add Movie Night". Below the title is a form with the heading "Enter the Movie Night Data:". The form contains several input fields for "Movie night time:", "Movie Name:", "Duration:", "Guest 1 Name:", "Guest 2 Name", "Guest 3 Name", "Guest 4 Name", and "Guest 5 Name". At the bottom of the form are two buttons: "Clear" and "Insert".

Enter the Movie Night Data:	
Movie night time:	<input type="text"/>
Movie Name:	<input type="text"/>
Duration:	<input type="text"/>
Guest 1 Name:	<input type="text"/>
Guest 2 Name	<input type="text"/>
Guest 3 Name	<input type="text"/>
Guest 4 Name	<input type="text"/>
Guest 5 Name	<input type="text"/>
<input type="button" value="Clear"/>	<input type="button" value="Insert"/>



Video Demo



What is PHP?

- PHP (recursive acronym for *PHP: Hypertext Preprocessor*) is a widely-used open source general-purpose scripting language that is especially suited for web development and can be embedded into HTML.
 - <https://www.tutorialspoint.com/php/index.htm>

<html>

<head> <title> Hello </title> </head>

<body>

<?php

if (!isset(\$_REQUEST['name']))

{ echo "Hello World"; }

else { echo "Hello, " + \$_REQUEST['name']; }

?>

</body>

</html>



PHP Installation Overview

In order to develop a web database application using PHP we need:

- Azure SQL Database
- Install PHP
 - ▶ <https://www.php.net/manual/en/install.general.php>
- Apache HTTP Web-Server
 - ▶ <https://httpd.apache.org/download.cgi>
- ODBC driver for Azure SQL
 - ▶ <https://docs.microsoft.com/en-us/azure/sql-database/sql-database-connect-query-php>
- (Optional) Eclipse IDE for PHP Developers
 - ▶ <https://www.eclipse.org/downloads/packages/>



PHP Installation Recommendation

If you're not familiar with PHP development environment and what to try it out, we recommend:

- Download & Install Oracle Virtual Box – software for installing virtual (guest) operating systems and running them from existing (host) operating system - <https://www.virtualbox.org/wiki/Downloads>
 - User Manual - <https://www.virtualbox.org/manual/UserManual.html>
- Download & Install Ubuntu 18.04 LTS as your guest operating system
 - <https://ubuntu.com/download/desktop>
- Follow Microsoft's instruction on installing PHP, Apache Web-server & ODBC driver for Azure SQL Database. They are rather good.
 - <https://docs.microsoft.com/en-us/sql/connect/php/installation-tutorial-linux-mac?view=sql-server-2017#installing-the-drivers-on-ubuntu-1604-1804-and-1810>



Example Web Application

We will attempt to build exactly the same application we've built with JSP, but now do so using PHP.

```
CREATE TABLE movie_night (  
    start_time DATETIME PRIMARY KEY,  
    movie_name VARCHAR(64),  
    duration_min INT,  
    guest_1 VARCHAR(64),  
    guest_2 VARCHAR(64),  
    guest_3 VARCHAR(64),  
    guest_4 VARCHAR(64),  
    guest_5 VARCHAR(64),  
);
```




Video Demo



End of Topic 7