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Topic 7: Application Development (Ch. 9)

Database System Concepts

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 (homework 3)
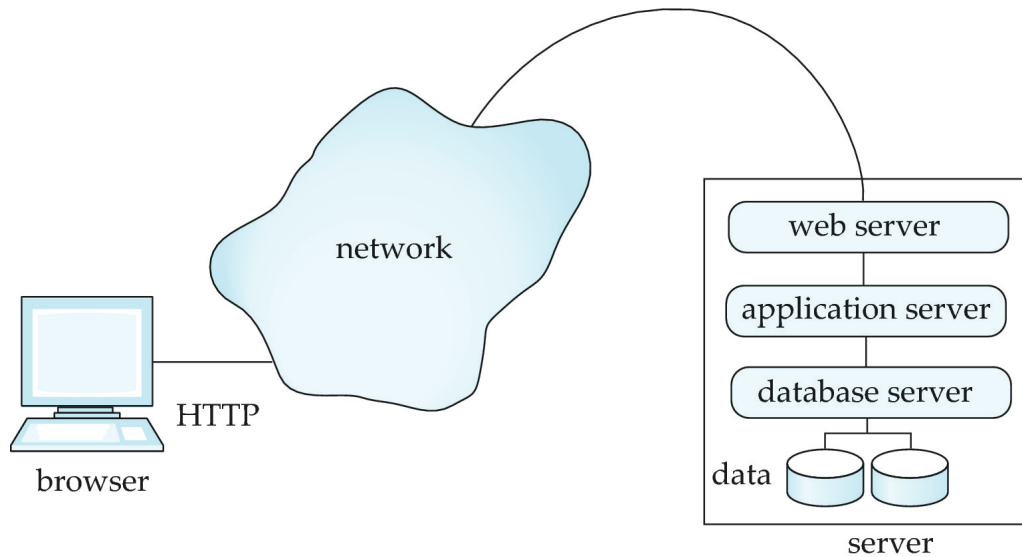 - ▸ Interacting with a user through a command prompt

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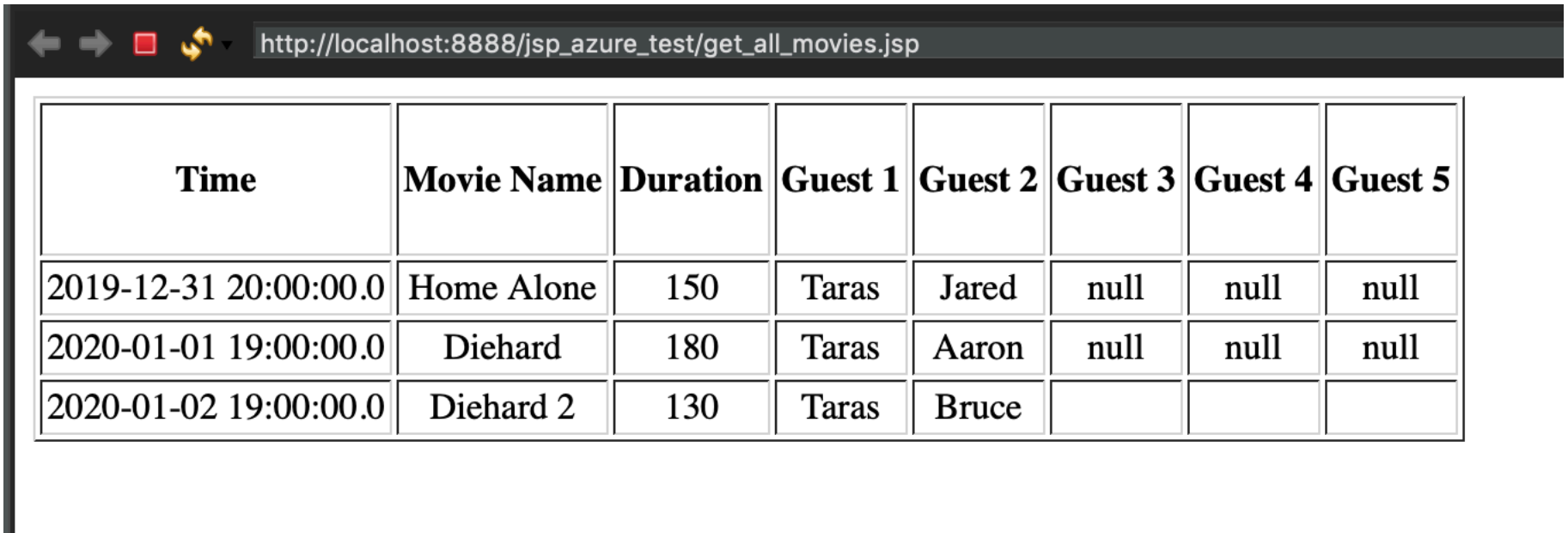
```sql
CREATE TABLE movie_night (
      start_time DATETIME PRIMARY KEY,
      movie_name VARCHAR(64),
      duration_min INT,
      guest_1 VARCHAR(64),
      guest_2 VARCHAR(64),
      guest_3 VARCHAR(64),
      guest_4 VARCHAR(64),
      guest_5 VARCHAR(64),
);
```

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

http://localhost:8888/jsp_azure_test/get_all_movies.jsp

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

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 want 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 20.04 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.

```sql
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),
);
```

Demo

End of Topic 7