Introduction to IBM DB2

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What is it?

- IBM
- DB2 (Database 2)
- An object-relational database:
  - No software limitations (e.g., size database, number of tables, number of entities per table).
  - Very scalable (it can grow to fit your needs).
  - Efficient for numerous concurrent clients

Concurrent Clients

- GIS for the Enterprise
  - Potential concurrent clients
Server Installation

• The amount of random-access memory (RAM) required to run any edition of DB2 is 512 MB.
  – 1 GB is recommended for improved performance
• Required disk space depends on type of installation and type of file system

Professional Tips

• Administration password
  – DBADMIN
  – ADMINISTRATOR

DB2 Editions
Personal Configuration

• **Personal Edition**
  – DB2 Personal Edition is a single-user version of the full DB2 product.
  • Has most features available in Express Edition
  • Remote clients cannot connect to this edition
  • Can be remotely administered with DB2 administration tools
  • Net Search Extender
  • Spatial Extender

Express Configuration

• **Express Edition**
  – Built in autonomic manageability features
  – Supports high availability (HA) architectures
  – Net Search and Spatial Extenders
  – pureXML
  – Homogeneous federation
  – Scalable with Features Packs

Workgroup Configuration

• **Workgroup Server Edition**
  – Contains all of Express Edition
  – Includes High Availability Feature Pack
  – Online table reorganizations
  – Tivoli System Automation (TSA) high availability services
  – Support for DB2 advanced copy services
  – High Availability Disaster Recovery (HADR)
Enterprise Configuration

- **Enterprise Server Edition**
  - DB2 Enterprise Edition is designed for large databases with many users. It contains all the functionality of the Workgroup Edition, plus:
    - A license for an unlimited number of client connections
    - Includes services for parallelism, MDCs, MQTs, table partitioning and more
    - Scalable with additional Feature Packs

Professional Tips

- DB2 licensed per CPU in your server
- Consider DBA overhead
  - Oracle is DBA intensive
  - SQL Server least overhead
  - DB2 to date...

DBA

- GUI based database administration
- Alternatively, command prompt can be used.
Creating Databases/tables

- Use the Control Center
- A database can be a new instance of DB2
- The name you specify must be 1 to 8 characters in length
- To avoid potential problems:
  - do not use the special characters @, #, and $ in a database name if you intend to have a client remotely connect to a host database.
  - Also, because these characters are not common to all keyboards, do not use them if you plan to use the database in another country.
- On Windows NT-based systems (8, 10, Server 2008, etc.), ensure no instance name is the same as a service name.

Checking Service Names

C:\Windows\System32\drivers\etc

DB2 Specifics

- Pre-fetch
- Buffer pools
- Table data pages
DB2 Data Types (Numeric)

- FOR BIT DATA (boolean)
- BYTE (0-255)
- SMALLINT (-32,768 to 32,767)
- INTEGER (-2,147,483,648 to 2,147,483,647)
- FLOAT <n>
- DOUBLE PRECISION <n_p, n_s>

DB2 Parameters in ArcGIS

- FLOAT <n_p, n_s>
  - n_p (precision, total field length)
  - n_s (decimal places)
  - n must be between 1-6 (larger n values need to use DOUBLE)
  - n_p, n_s = 5,3 → 26.589 is OK, 256.381 is not
  - Five (5) total characters 2 6 . 5 8 9

Parameters (cont’d)

- DOUBLE PRECISION <n_p, n_s>
  - n_p = 7 or more
  - n_s = 0 or more
DB2 Data Types (Character)

- CHARACTER\(<n\>
- VARCHAR\(<n\>

Parameters (cont’d)

- CHARACTER\(<n\>:
  - (AKA, String or Text)
  - Example a field named "URL" with \(n = 46\)
  - http://giscenter.isu.edu/training/it4gis.htm

DB2 Data Types (Special)

- DATE
- TIME
- TIMESTAMMP
DB2 Data Types (Special)

- Stored in special System managed tables
  - BLOB<n[K|M|G]>
  - CLOB<n[K|M|G]>
  - DBCLOB<n[K|M|G]>
  - GRAPHIC<n>
  - VARGRAPHIC<n>

Table Data Pages

- All fields with standard data types for each record are contained within a single data page.
- There is a maximum of 255 records stored on each page.
- The ART of efficient data modeling is to minimize wasted space on a page while maximizing the proportion of each page written.

An Instance Example

<table>
<thead>
<tr>
<th>KB per record</th>
<th>page size</th>
<th>255 records</th>
<th>wasted space</th>
<th>used space</th>
<th>100 GB table space</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.02</td>
<td>4 KB</td>
<td>5.1</td>
<td>200</td>
<td>4</td>
<td>0 GB wasted</td>
</tr>
<tr>
<td>0.02</td>
<td>8 KB</td>
<td>5.1</td>
<td>255</td>
<td>5.1</td>
<td>29 GB wasted</td>
</tr>
</tbody>
</table>
DB2 for GIS

• **DB2 Spatial Extender** lets you integrate geographic data with your existing business data. It includes:
  – Data types such as points, lines, and polygons
  – Functions such as area, endpoint, and intersect
  – An indexing scheme for spatial data
  – This product is available for all editions of DB2

Questions?

Key Concepts

• Understand that while data is stored in tables, the tables span TABLE PAGES
• Understand what PRE-FETCH and CACHE are…and how they differ.
• Understand DB2 specific data types
Your Assignment

• Read IBM DB2 Ref (PDF)
• Complete the exercise
  – Design table pages with the “DB2 Database Administration” exercise