Experiencing MIS

Fifth Canadian Edition

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EXPERIENCING **MIS**
FIFTH CANADIAN EDITION

Updated to align with the new CPA
Canada IT Knowledge Supplement

Chapter 5

Database and Content
Management

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Study Questions

Q5-1 Why do you need to know about databases, and what is their purpose?

Q5-2 What is content and how is it organized?

Q5-3 What does a database contain?

Q5-4 What is a DBMS, and what does it do?

Q5-5 What is a database application?

Q5-6 What is the difference between databases and where are we headed?

Q5-1: Why Do You Need to Know About Databases?

- Databases are accessed every time you got into the Internet, make a cell phone call, buy something online with a credit card, etc.

- Snapchat, Facebook, Twitter, LinkedIn, Google; all are using databases

Reasons for Learning Database Technology

- Will database technology facilitate your project goals?

- How to turn data into a format that provides you with useful information

- Understand if structural changes are needed, or a new database.

- Assess if and/or when your company should build their own database.
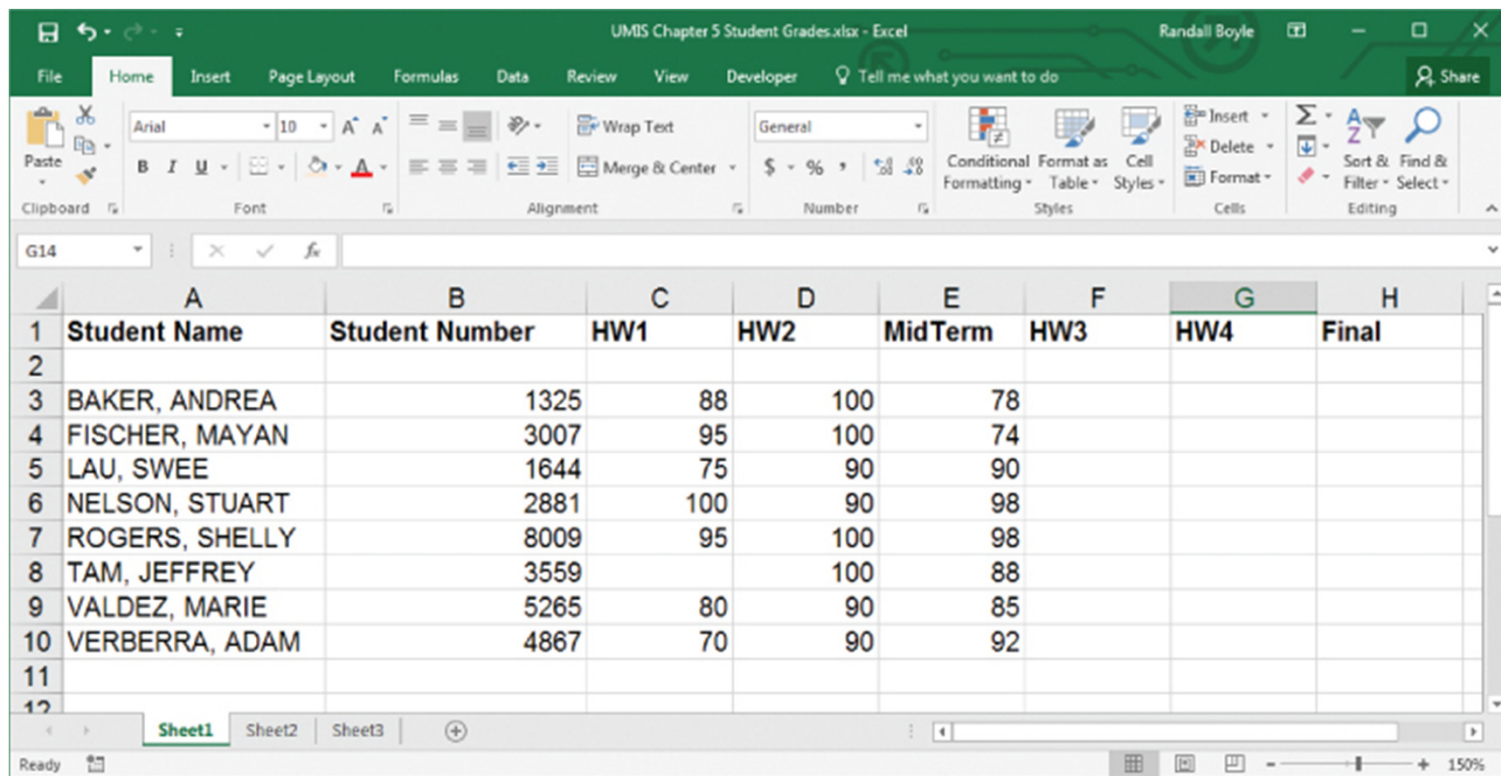
What Is the Purpose of a Database?

- Organize and keep track of things

- Keep track of multiple themes

- General rule:
    - Single theme – can store data in a spreadsheet
    - Multiple themes - require a database
    - What's a theme?
        - Ex: student grades, student emails, student office visits.

Figure 5-1
A List of Student Grades

Example of a single theme.

	A	B	C	D	E	F	G	H
1	Student Name	Student Number	HW1	HW2	MidTerm	HW3	HW4	Final
2								
3	BAKER, ANDREA	1325	88	100	78			
4	FISCHER, MAYAN	3007	95	100	74			
5	LAU, SWEE	1644	75	90	90			
6	NELSON, STUART	2881	100	90	98			
7	ROGERS, SHELLY	8009	95	100	98			
8	TAM, JEFFREY	3559		100	88			
9	VALDEZ, MARIE	5265	80	90	85			
10	VERBERRA, ADAM	4867	70	90	92			
11								

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Figure 5-2
Student Data Shown in Form of a Database

Example of multiple themes.

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Q5-2: What Is Content?

- related to **intellectual property**
  - form of creative endeavour that can be protected through a trademark, patent, copyright, industrial design, or integrated circuit topography

- **Content**: Something of value, which can be considered an asset
  - Can be stored as data, documents, spreadsheets, presentations, websites, text from blogs, Twitter, or discussion boards, graphics, video files and video logs, audio files, etc.

How Can Content Be Organized?

- Management of content
  - Indexing, cataloguing, processing, storing bytes

- Presentation of content
  - Distributing to the right person, right format
  - Usually handled by content management system (CMS)
    - Employee loads raw content to CMS, it gets reviewed/edited/art created, as needed, then published
    - No longer relegated to input only – now CMS systems can seek relevant documents across the organization and manage the content automatically, as well as archive
    - Example: OpenText, in Waterloo, Ontario

Q5-3: What Does a Database Contain?

- **Database**: a self-describing collection of integrated records

- Hierarchy of data elements
    – Byte is a character of data
    – Bytes are grouped into columns/fields
    – Columns grouped into rows/records
    – Rows are grouped into tables/files

Figure 5-3
Student Table (Also Called a *File*)

Columns, also called *fields*

Student Number	Student Name	HW1	HW2	MidTerm
1325	BAKER, ANDREA	88	100	78
1644	LAU, SWEE	75	90	90
2881	NELSON, STUART	100	90	98
3007	FISCHER, MAYAN	95	100	74
3559	TAM, JEFFREY		100	88
4867	VERBERRA, ADAM	70	90	92
5265	VALDEZ, MARIE	80	90	85
8009	ROGERS, SHELLY	95	100	98

Rows, also called *records*

Characters, also called *bytes*

MIS – Database II – MS Access

- Self-describing collection of integrated records

Student Table

Student Number	Student Name	HW1	HW2	MidTerm
1325	BAKER, ANDREA	88	100	78
1644	LAU, SWEE	75	90	90
2881	NELSON, STUART	100	90	98
3007	FISCHER, MAYAN	95	100	74
3559	TAM, JEFFREY		100	88
4867	VERBERRA, ADAM	70	90	92
5265	VALDEZ, MARIE	80	90	85
8009	ROGERS, SHELLY	95	100	98

TABLE
- Comprised of 5 **FIELDS**

MIS – Database II – MS Access

- ## Self-describing collection of integrated records

Student Table

Student Number	Student Name	HW1	HW2	MidTerm
1325	BAKER, ANDREA	88	100	78
1644	LAU, SWEE	75	90	90
2881	NELSON, STUART	100	90	98
3007	FISCHER, MAYAN	95	100	74
3559	TAM, JEFFREY		100	88
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1325	BAKER, ANDREA	88	100	78
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3559	TAM, JEFFREY		100	88
4867	VERBERRA, ADAM	70	90	92
5265	VALDEZ, MARIE	80	90	85
8009	ROGERS, SHELLY	95	100	98

TABLE
- Comprised of 8 **RECORDS**

Figure 5-4
Hierarchy of Data Elements

Table or File
Student Number Student Name HW1
Student Number Student Name HW1
Student Number Student Name HW1
Student Number Student Name HW1
Student Number Student Name HW1 ...

Group of

Records or Rows | Student Number | Student Name | HW1 | ... | , ...

Group of

Fields or Columns | Student Number | Student Name | HW1 | , ...

Group of

Bytes or Characters B A K E R , ...
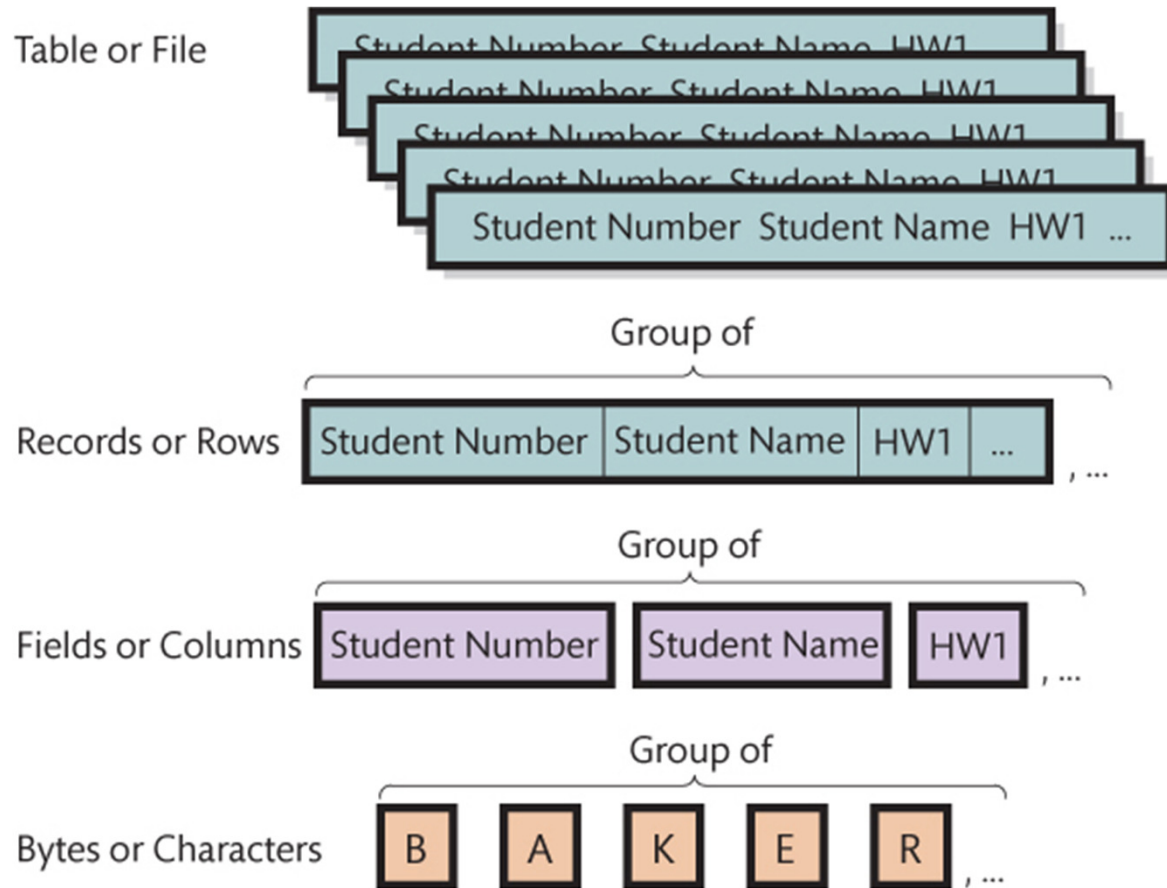
Figure 5-5
Components of a Database

A collection of tables *plus* relationships among the rows in those tables, *plus* metadata

Tables or Files
+
Relationships among Rows in Tables
+
Metadata
= Database
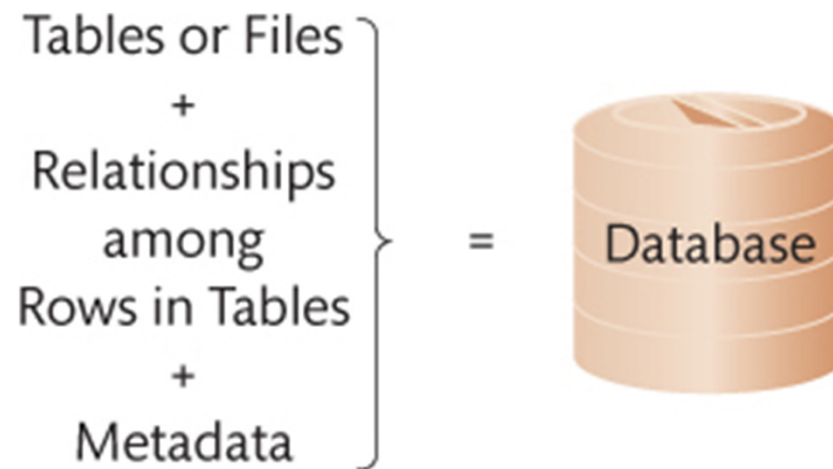
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Relationships Among Records

- Values in one table may relate to rows in other table(s)

- Keys
  - Column(s) that identify unique row in table
  - Each table has a key

- Foreign keys
  - Keys in a different table than the one in which they reside

- Relational database
  - Databases using tables, keys, and foreign keys

Figure 5-6
Example of Relationships Among Rows

Email Table

EmailNum	Date	Message	Student Number
1	2/1/2007	For homework 1, do you want us to provide notes on our references?	1325
2	3/15/2007	My group consists of Swee Lau and Stuart Nelson.	1325
3	3/15/2007	Could you please assign me to a group?	1644

Student Table

Student Number	Student Name	HW1	HW2	MidTerm
1325	BAKER, ANDREA	88	100	78
1644	LAU, SWEE	75	90	90
2881	NELSON, STUART	100	90	98
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4867	VERBERRA, ADAM	70	90	92
5265	VALDEZ, MARIE	80	90	85
8009	ROGERS, SHELLY	95	100	98

Office_Visit Table

VisitID	Date	Notes	Student Number
2	2/13/2007	Andrea had questions about using IS for raising barriers to entry.	1325
3	2/17/2007	Jeffrey is considering an IS major. Wanted to talk about career opportunities.	3559
4	2/17/2007	Will miss class Friday due to job conflict.	4867

Metadata

- Recall that databases are *self-describing*
  - Collection of integrated records
  - Contains, within itself, a description of its contents

- Metadata
  - Data that describe data
  - Makes databases more useful than spreadsheets
  - Makes databases easier to use

Figure 5-7
Example of Metadata (in Access)

Field Name	Data Type	Description (Optional)
EmailNum	AutoNumber	Primary key -- values provided by Access
Date	Date/Time	Date and time the message is recorded
Message	Long Text	Text of the email
Student Number	Number	Foreign key to row in the Student Table

Field Properties

General | Lookup

Format	Short Date
Input Mask	99/99/0000;0;#
Caption	
Default Value	=Now()
Validation Rule	
Validation Text	
Required	Yes
Indexed	No
IME Mode	No Control
IME Sentence Mode	None
Text Align	General
Show Date Picker	For dates

A field name can be up to 64 characters long, including spaces. Press F1 for help on field names.

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Q5-4: What Is a DBMS, and What Does It Do?

- **Database Management System** (DBMS)
  - Make databases more accessible and useful
  - Program that creates, processes, and administers a database
  - Usually licensed from vendors
    - IBM, Microsoft, Oracle, IBM, MySQL (open-source)
    - Organizations rarely develop their own

- DBMS and database are two different things

Figure 5-8
Components of a Database Application System
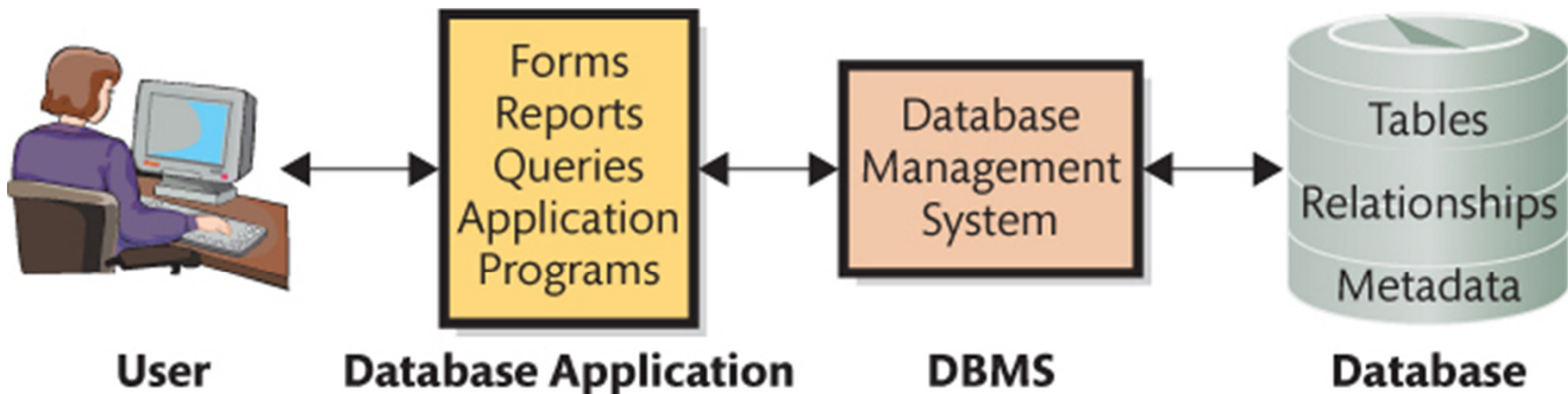
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The Database Management System (1 of 2)

Three main functions of the DBMS

1. Create the database and its structures
   - create tables and relationships in the database

2. Process the database
   - read, insert, modify, or delete data
   - Use Structured Query Language (SQL)
     - international standard for processing a database

3. Provide tools to administer the database

The Database Management System

- Administering the Database
  - User accounts with passwords, permissions, limits
  - Can be used to set up a security system
  - Used to back up data
  - Add structure to improve performance
  - Remove data

Q5-5: What Is a Database Application?

- Collection of forms, reports, queries, and application programs that process a database

- Databases can have more then one application

- Each applications can have multiple users

Figure 5-10
Multiple Database Applications

Order-Entry Application

Purchasing Application

Warehouse Management Application

DBMS

Inventory Database

Users
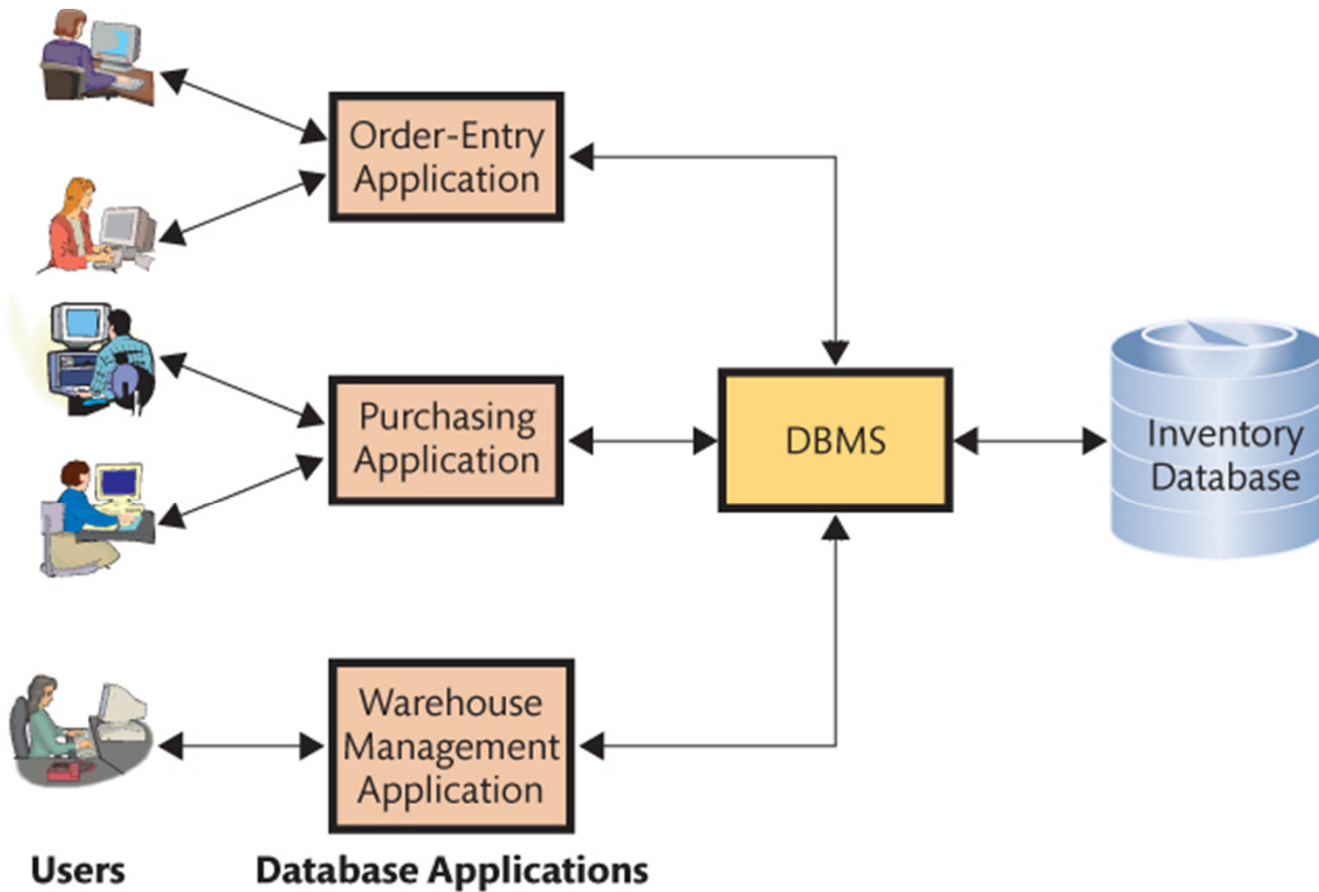
Database Applications

Forms, Reports, and Queries

- Forms
  - Used to read, insert, modify, and delete data

- Reports
  - Show data in structured context
  - May compute values

- Queries
  - Means of getting answers from database data

Database Application Programs

- Forms, reports, and queries work for standard functions

- Application programs provide more robust information
  - Process logic specific to business need
  - Enables database processing over Internet
    - serves as intermediary between Web server and database
    - responds to events
    - reads, inserts, modifies, deletes data

Figure 5-13
Four Application Programs on a Web Server Computer
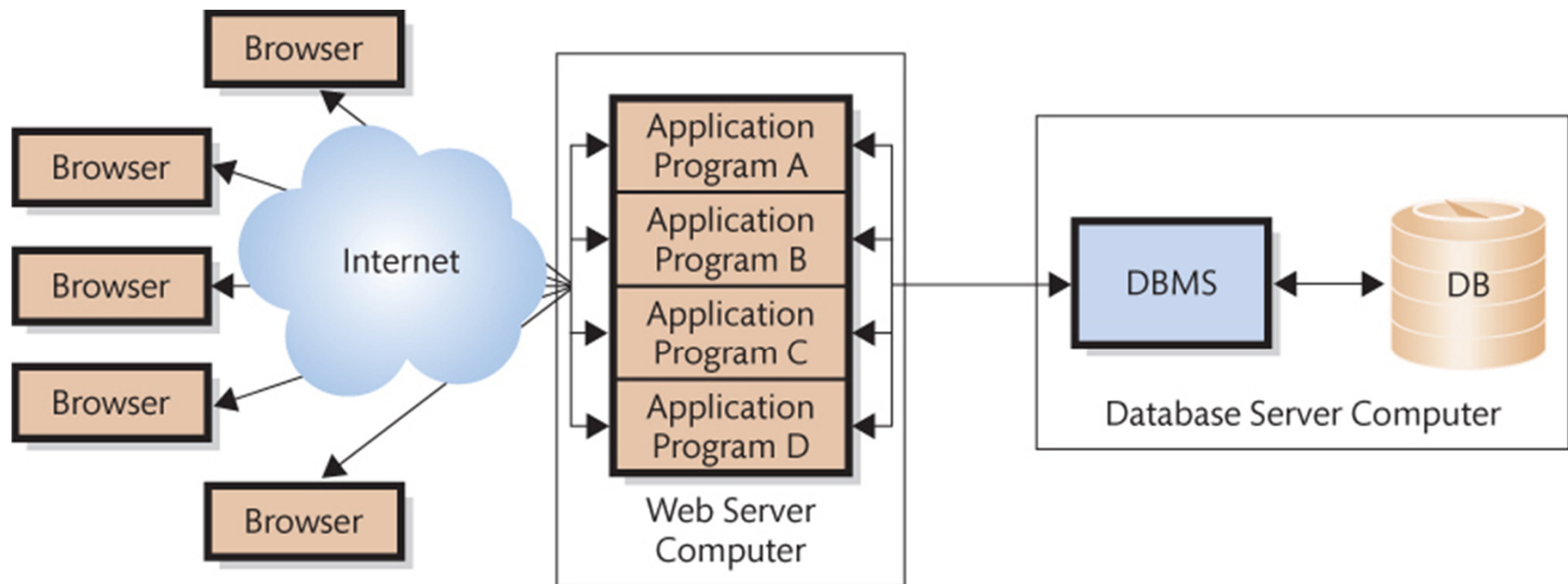
Multi-User Processing

- Common, but poses unique problems
  - **Lost-update problem**
    - When two users are using order entry application at same time
    - Some type of locking needed to be able to co-ordinate user activity
    - Shows need to consider multiple users
    - When unresolved, produces data conflicts

Q5-6: What Is the Difference Between an Enterprise DBMS and a Personal DBMS? (1 of 2)

- **Enterprise DBMS**
    - Process large organizational and workgroup databases
    - Support many users and many different database applications
        - Examples: IBM's DB2, Microsoft's SQL Server, and Oracle's Oracle

Q5-6: What Is the Difference Between an Enterprise DBMS and a Personal DBMS? (2 of 2)

- **Personal DBMS**
  - Designed for smaller, simpler database applications
  - Supports fewer than 100 users, normally fewer than 15
    - Microsoft Access is the only remaining personal DBMS in Microsoft
  - Relational model used to be standard for processing databases
    - because of storage and processing technology, but was not a natural fit with business docs
    - Is no longer being used ?
      (not too sure about this …)

Need to Store New Data Types Differently

- Newer types of data (images, audio, video) do not fit into relational structures, but still need metadata

- New types of data don't need ACID transactions
  - **ACID**: atomic, consistent, isolated, durable
    (all-or-none transaction processing)
    - Important for buy and sell slides of a transactions
    - Not important in part of a tweet

- Need for speed: faster processing
  - Examples: Amazon.com's Dynamo, Google's Bigtable, Facebook's Cassandra.

Non-Traditional DBMS types (1 of 2)

1. **NoSQL DBMS**

- non-relational, high transaction rates, simple data structures, no ACID support
  - MongoDB, Cassandra, Dynamo

2. **NewSQL DBMS:**

- high transactions
- ACID support
- may/may not be relational
- Many players in market now, more coming

3. In-memory DBMS

- databases processed in main memory

- usually relational

  – SAP HANA, high-volume ACID support with relational query processing

  – Tableau Software, proprietary in-memory DBMS using an extension to SQL

Will These New Products Replace the Relational Model?

- Probably not.
  - Conversion enormously expensive and disruptive
  - NoSQL DBMS products very technical and require a deep background in computer science to use

- NoSQL's impact on DBMS product market?
  - Database software market experience viable new entrants

What Do Nonrelational DBMS Mean for You?

- What do non-relational DBMS mean for you?
  - Knowledge is useful – stay abreast of developments
  - Watch nonrelational DBMS product developments from an investor's perspective
  - New opportunities and career paths will develop around nonrelational databases
  - Use knowledge to separate yourself from competition when it comes to job interviews