

# Database Design

... DBMS

## MIS – Database III – DBMS

# Databases

- Databases
- DBMS
- Database application
- Enterprise vs Personal DBMS

# Content

- Organizations may store
    - Data
    - Documents
    - Spreadsheets
    - Presentations
    - web pages
    - text from blogs and discussion boards
    - graphics,
    - video files
    - audio files ...
- Challenge is NOT collecting, but distributing and presenting the content**

# Organizing Content

- Content management challenge
  - processing and storing the right content
  - getting the right content to the right person in the right format at the right time

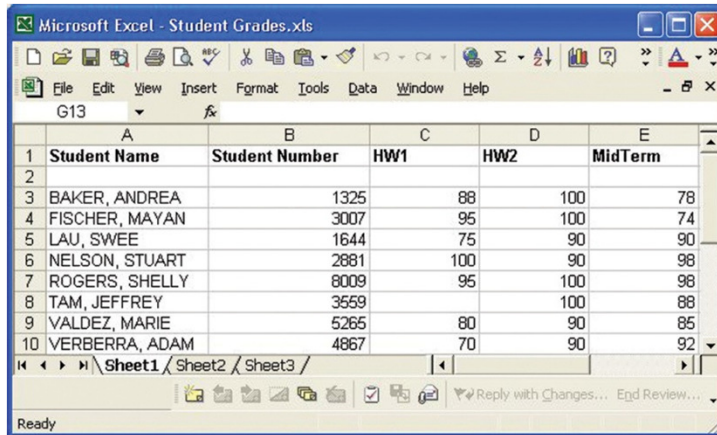
## Content Management

- Management of content data
  - database management systems (DBMS)
    - Effectively & Efficiently storing & processing data
- Presentation of content
  - content management system (CMS)
    - Organizing documents
    - Seek out documents & organize access

## Spreadsheet vs Database

- Keeping track of things
  - Spreadsheets
    - Keep lists of single concept
  - Databases
    - Keep lists that involve multiple themes

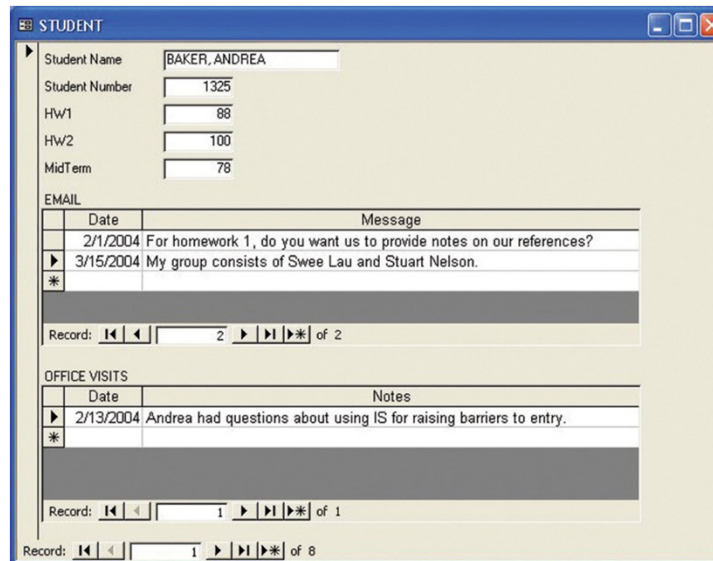
# MIS – Database III – DBMS



Microsoft Excel - Student Grades.xls

	A	B	C	D	E
1	Student Name	Student Number	HW1	HW2	MidTerm
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

Spreadsheet records  
simple list of student  
grades



STUDENT

Student Name: BAKER, ANDREA

Student Number: 1325

HW1: 88

HW2: 100

MidTerm: 78

EMAIL

Date	Message
2/1/2004	For homework 1, do you want us to provide notes on our references?
3/15/2004	My group consists of Swee Lau and Stuart Nelson.
*	

Record: 2 of 2

OFFICE VISITS

Date	Notes
2/13/2004	Andrea had questions about using IS for raising barriers to entry.
*	

Record: 1 of 1

Record: 1 of 8

Database records  
student grades,  
emails & office visits

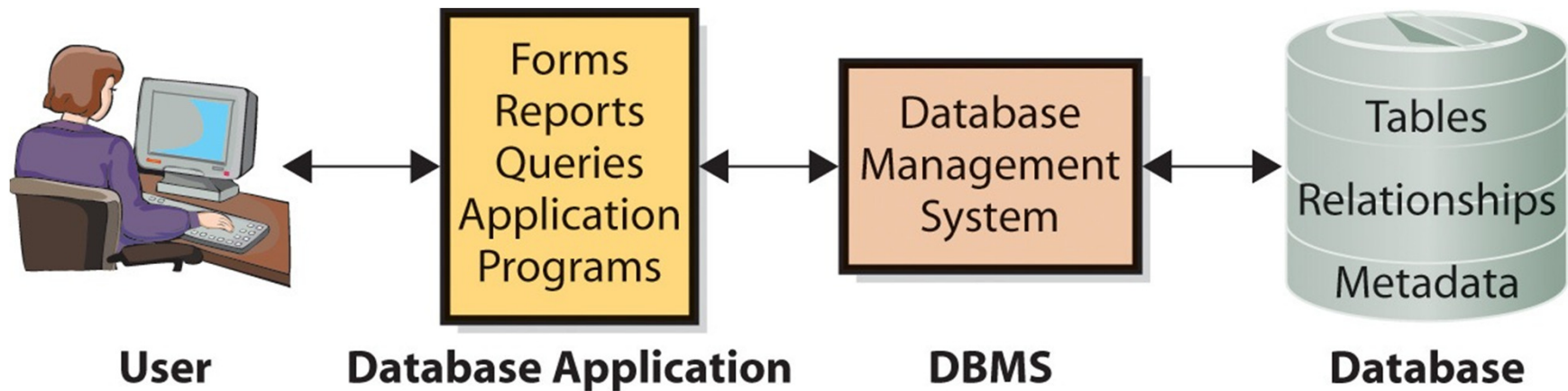
# Relational Database

- Conceptually simple
- Easy to understand
- Relationships aren't predefined
- Database can evolve as required
- Relationships are implied in the data



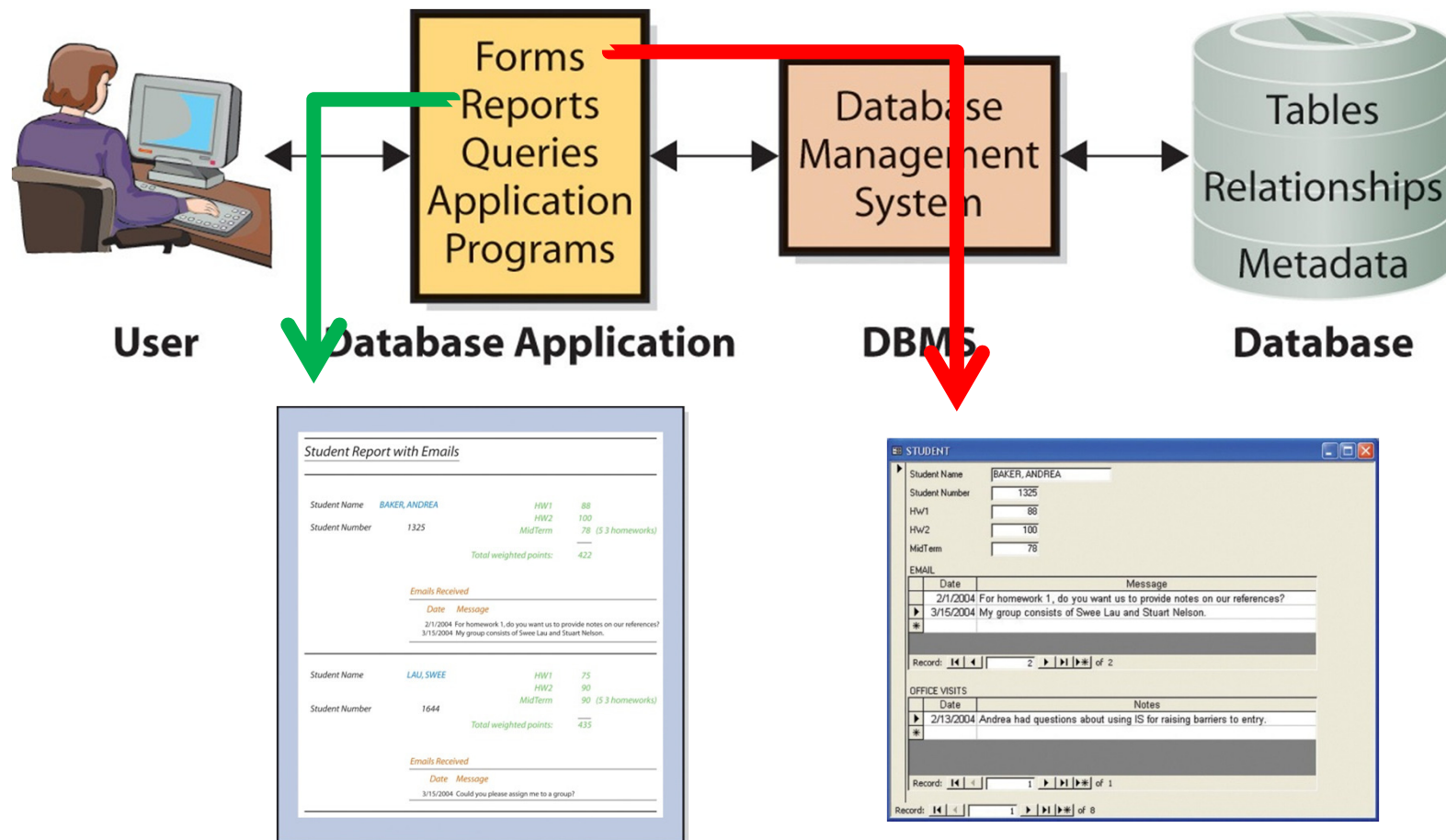
## MIS – Database III – DBMS

### Components of a Database Application System



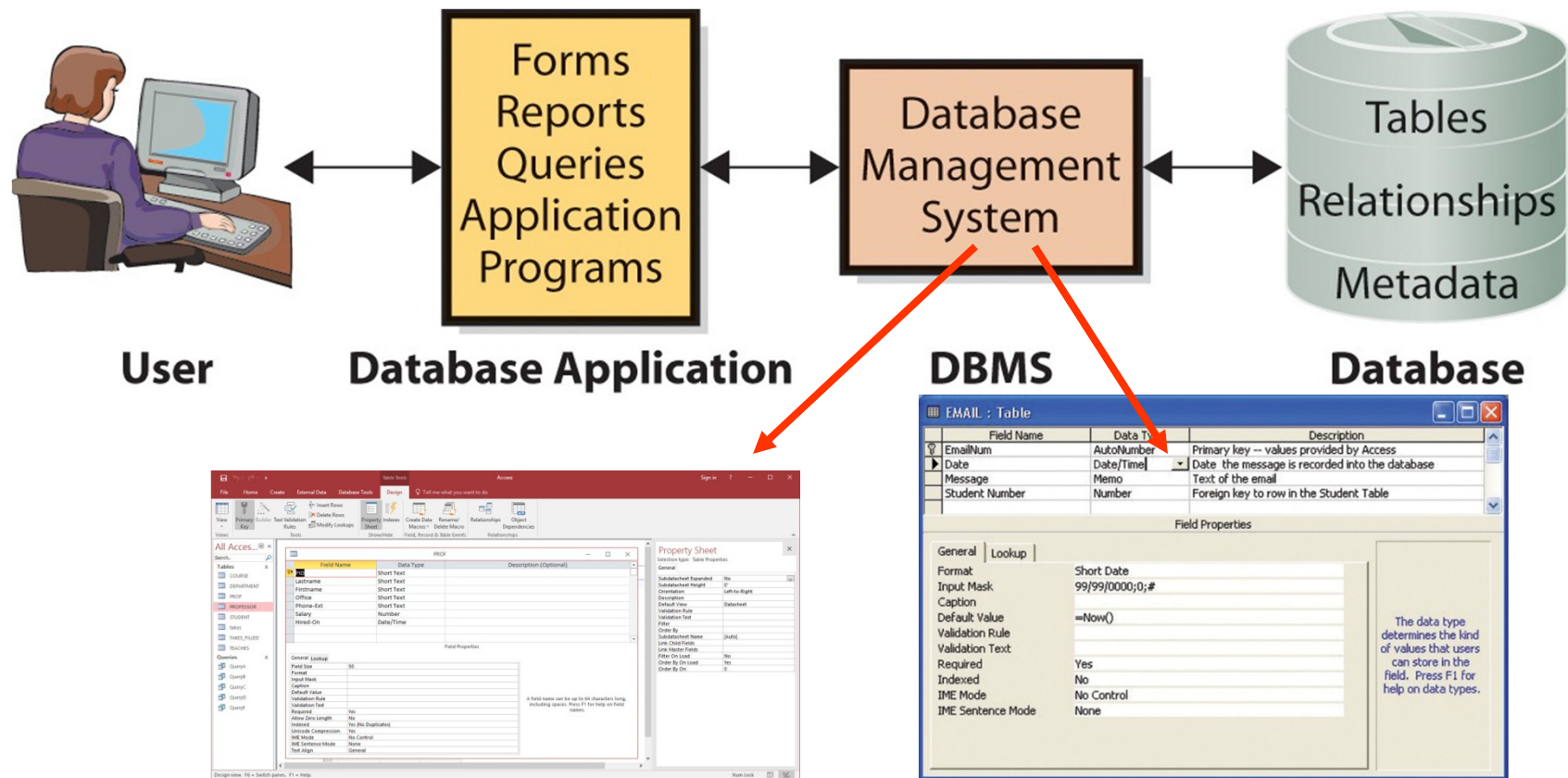
# MIS – Database III – DBMS

## Components of a Database Application System



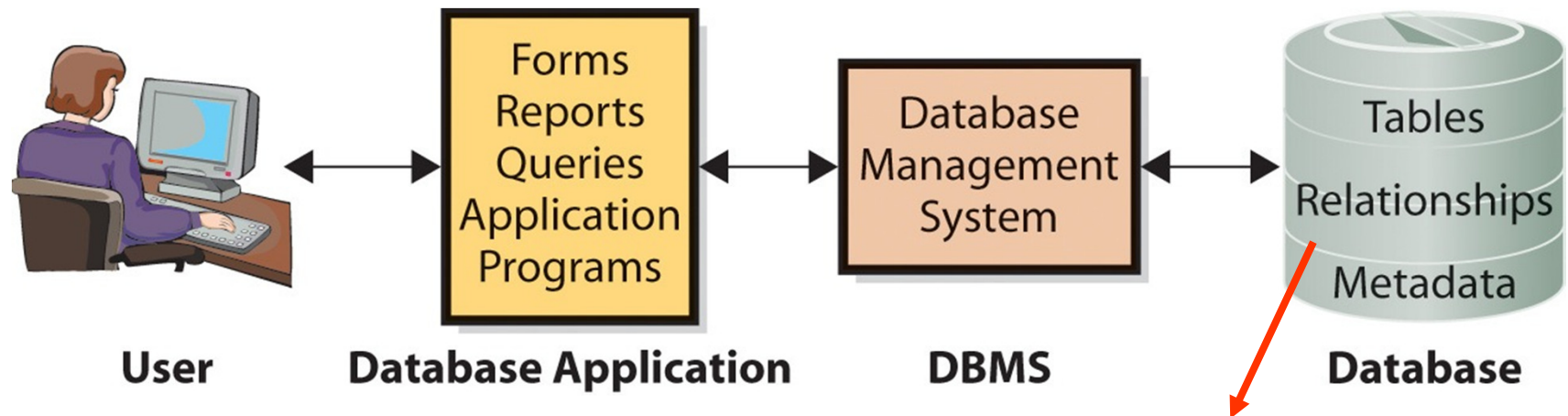
# MIS – Database III – DBMS

## Components of a Database Application System



# MIS – Database III – DBMS

## Components of a Database Application System



EmailNum	Date	Message	Student Number
1	2/1/2004	For homework 1, do you want us to provide notes on our references?	1325
2	3/15/2004	My group consists of Swee Lau and Stuart Nelson.	1325
3	3/15/2004	Could you please assign me to a group?	1644

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

VisitID	Date	Notes	Student Number
2	2/13/2004	Andrea had questions about using IS for raising barriers to entry.	1325
3	2/17/2004	Jeffrey is considering an IS major. Wanted to talk about career opportunities.	3559
4	2/17/2004	Will miss class Friday due to job conflict.	4867

## Database Management System (DBMS)

- Program
  - Creates database
  - Processes database
  - Administers database
- Usually licensed from vendors
  - Microsoft: Access, SQL server
  - Oracle: Oracle
  - IBM: DB2
  - Open Source: MySQL

## MIS – Database III – DBMS

# They are Different!

- Database
  - Collection of tables, relationships & metadata
- DBMS
  - Software program

## DBMS - Function

- Creation
  - Tables
  - Relationships in databases

## DBMS - Function

- Process database
- Applications use DBMS
  - Read data
  - Insert data
  - Modify data
  - Delete data



## DBMS - Function

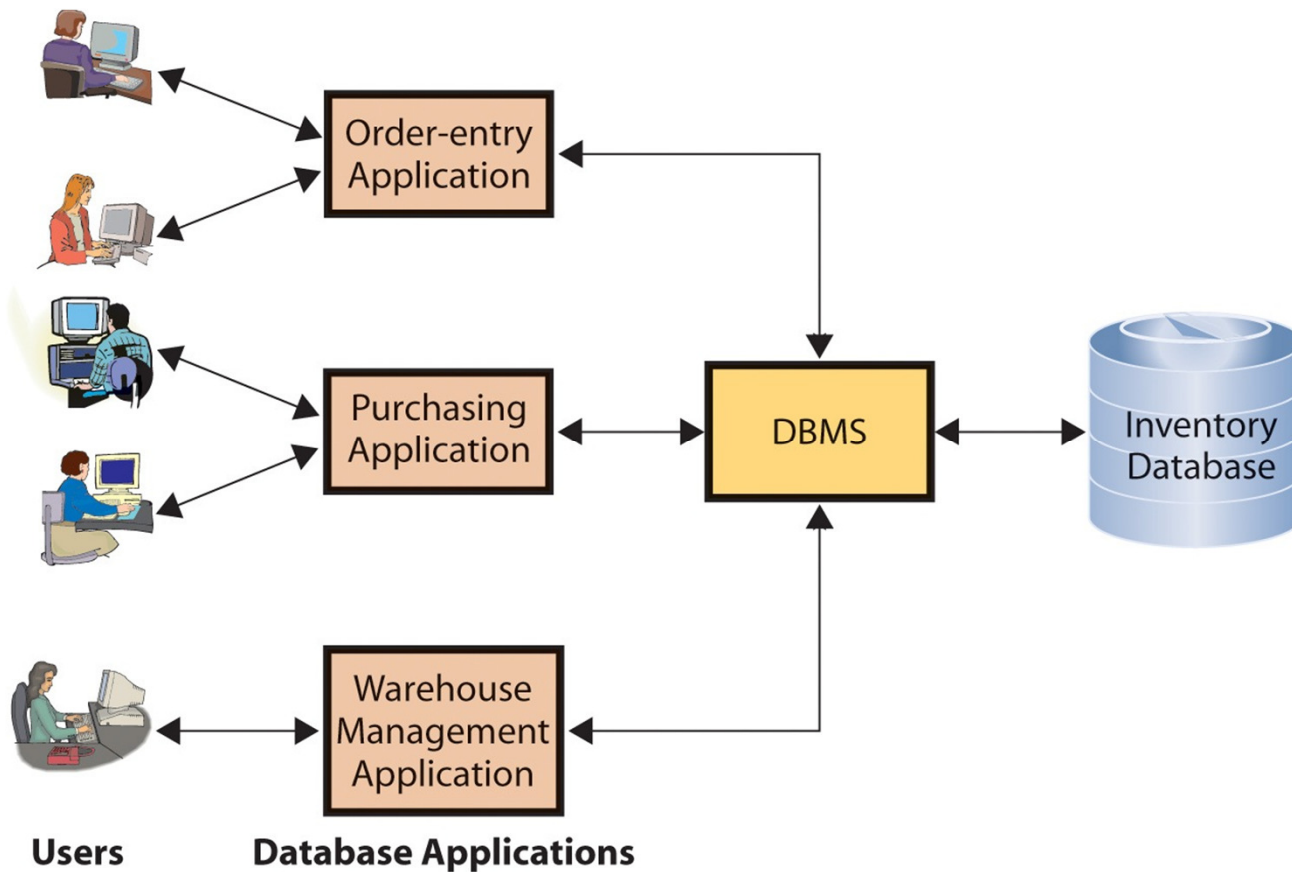
- Administration
  - Security (levels)
    - Access to the database
  - Backup
  - Improve performance
  - Removal of data no longer needed

# Database Application

- Collection
  - Forms
  - Reports
  - Queries
  - Application programs that process a database

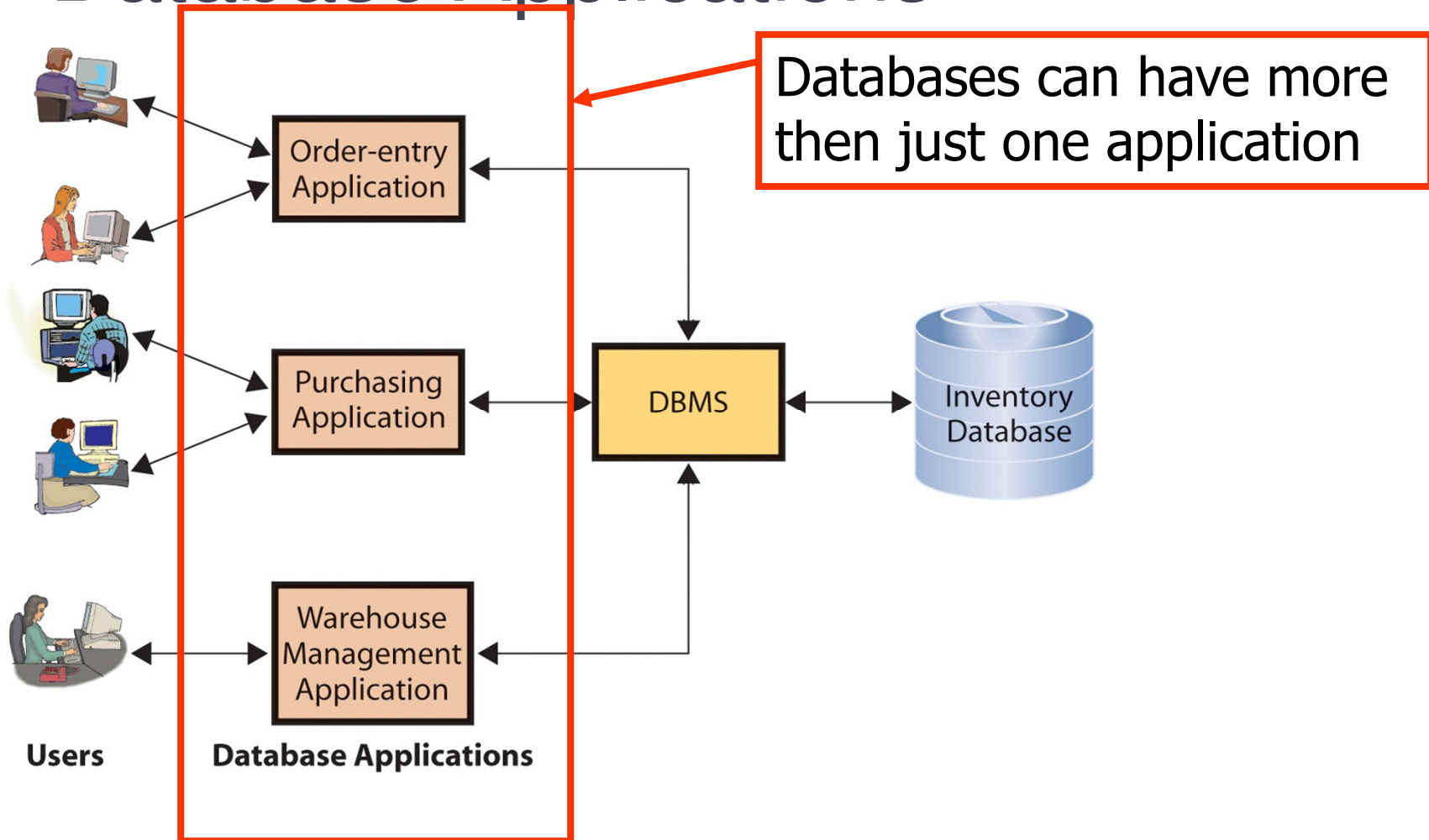
## MIS – Database III – DBMS

# Database Applications



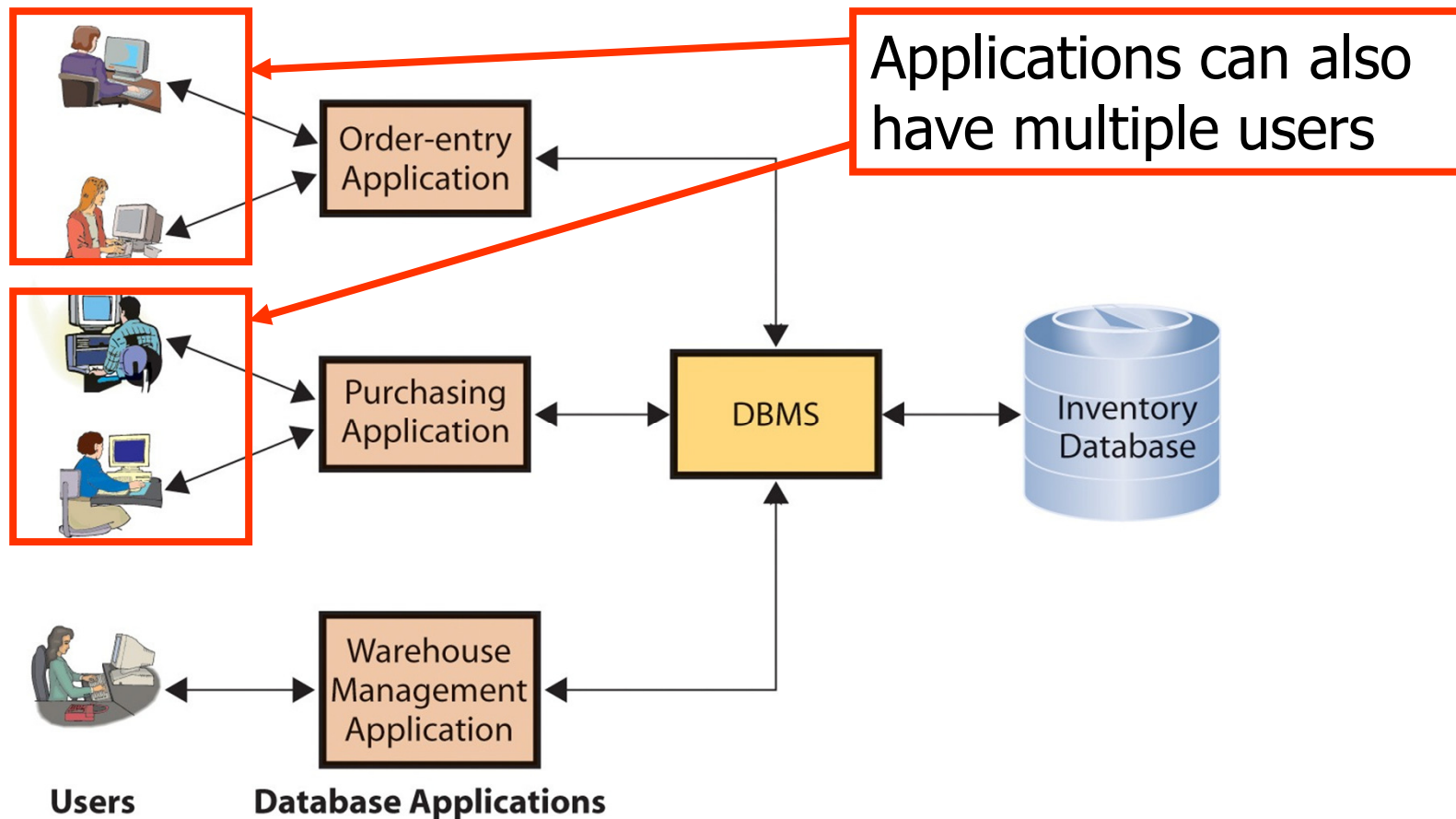
## MIS – Database III – DBMS

# Database Applications



## MIS – Database III – DBMS

# Database Applications

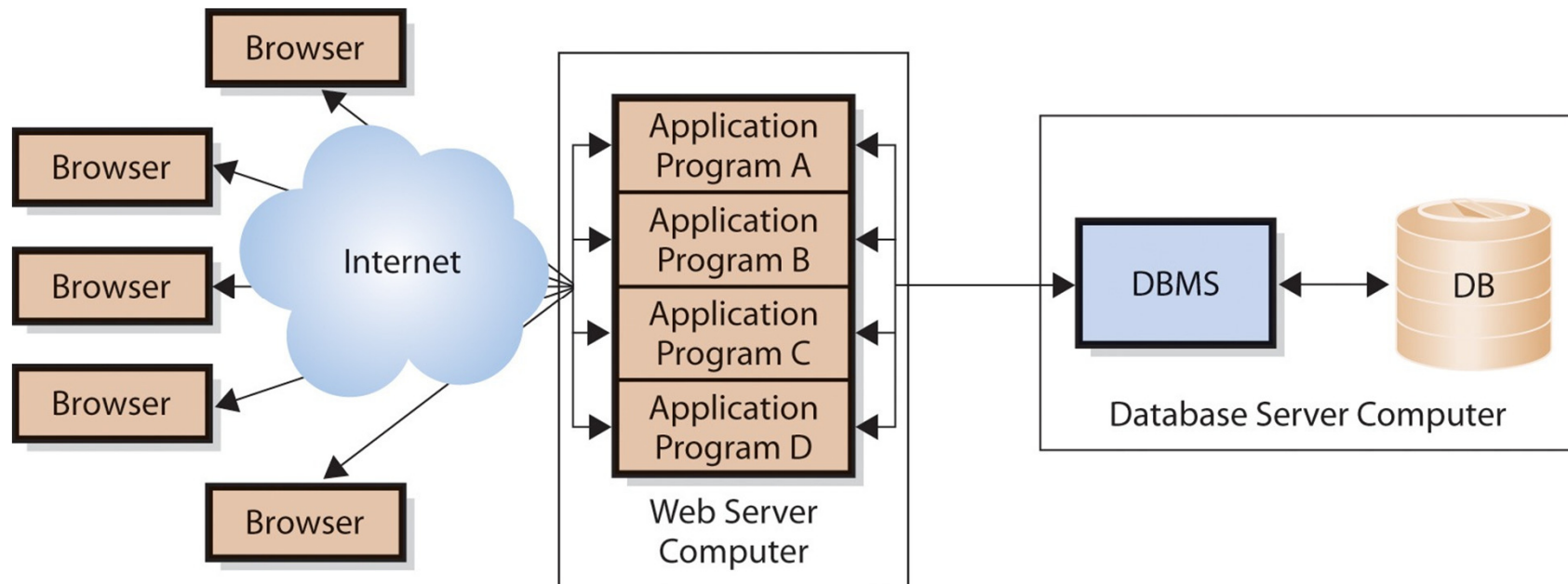


# Database Application Programs

- Forms, reports & queries
  - Standard functions
- Application programs
  - Process logic specific to business need
  - Enables database processing over Internet
    - Intermediary between Web server & database
    - Responds to events (Reads, inserts, modifies, deletes data)

## MIS – Database III – DBMS

### Application Programs on a Web Server



# Databases

- Enterprise
- Personal



## Enterprise DBMS

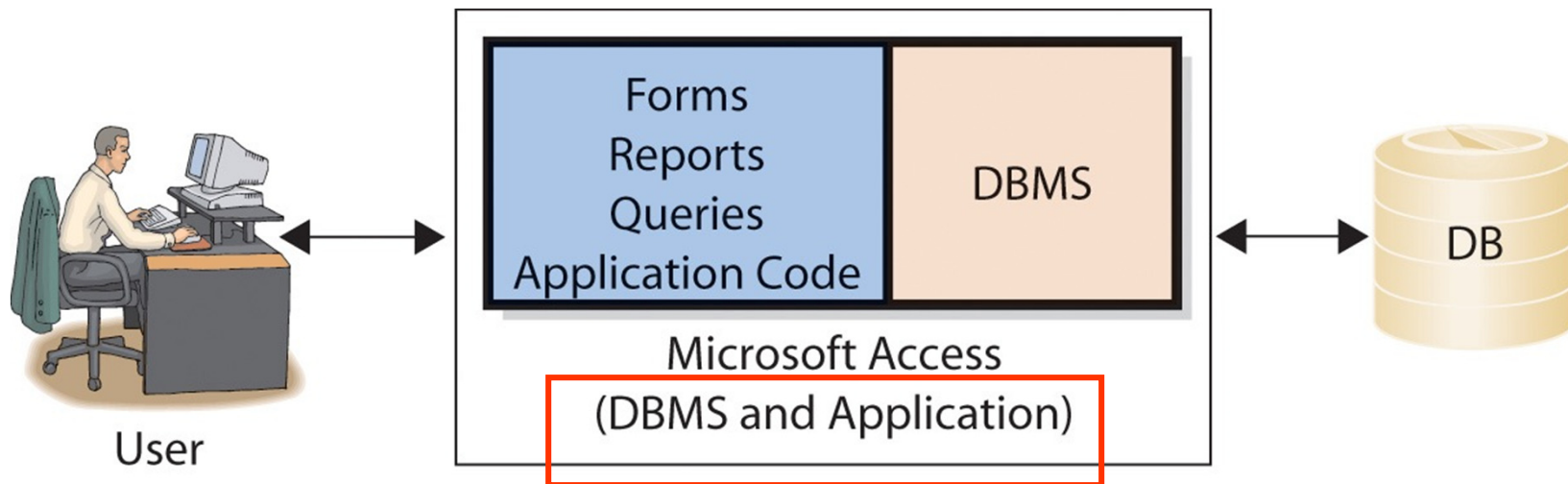
- Process organizational & workgroup databases
- Large Databases
- Support many, many users
- Examples: DB2, SQL Server, Oracle

## Personal DBMS

- Designed for smaller, simpler database applications
- Supports fewer than 100 users
- Examples: Access, dBase, FoxPro, Paradox, R:Base

## MIS – Database III – DBMS

# Personal Database System



# Database Security

## Permissions:

- Role-based access.
- User-based access.
- Context-based access.

## Authorization:

- Column access control.
- Row access control.
- Type of access. (Read -or- Read/Write etc.)

## MIS – Database III – DBMS

### **Role-based access.**

Your role in your school's database is student. All students have the same access rights.

Faculty members have different rights, as do staff in the registrar's office, admissions office, and so on.

Department chairs may have broader access than other faculty members.

The registrar may have broader access than clerks in that office.

## MIS – Database III – DBMS

### **User-based access.**

Each user has individually assigned access rights.

User-based access was used before role-based access came into use. It has drawbacks compared to role-based access: rights must be set up for each individual, inconsistencies can exist among people in the same job, and people may keep access rights they no longer need after a job change.

Today, when a person needs access that doesn't match his or her role, DBAs figure out what role the person has that requires that access, define that role, and put the person in it even if nobody else is in that role now or is expected to be in the future.

## MIS – Database III – DBMS

### **Context-based access.**

Access rights can vary by time of day or by the activity in progress.

A terminal on the factory floor may have access to parts inventory data during production hours, but not at night when only the custodial staff is in the building.

Custodians are as honest as anyone, but their job doesn't require inventory information.

If they had access to it, getting a job as a custodian could give a criminal unsupervised access to inventory information.

## MIS – Database III – DBMS

### **Column access control.**

Most users can access only part of a large database.

A manufacturing company might give quality engineers access to most supplier information,  
but not accounts receivable information for those suppliers.

University advisors can access students' academic records but  
(usually) not their financial aid or medical information.



## MIS – Database III – DBMS

### **Row access control.**

You can access your own grades, but not your roommate's.

You see full information about your LinkedIn connections,  
but less about other LinkedIn members.

## MIS – Database III – DBMS

### **Type of access.**

Most users of any database have read access.

You and your advisor can read your grades in your school's database, but can't change them.

Some users can create new database records.

The admissions office creates student records in the database, populating them with information it collects from their admission applications.

# Big Data

IBM estimates that 90% of the data now stored in computers worldwide did not exist two years ago.

Collectively, we generate new data at the rate of 2.5 quintillion bytes per day

- enough to fill the disk drives of 20,000 new PCs every week.

Much of this data can be of value, but earlier approaches to organizing and analyzing data don't work with **big data**.

# Big Data

Big Data has three (3) characteristics:

**Volume:** Big data means a lot of data.

**Velocity:** Data must be analyzed quickly.

**Variety:** Big data includes  
structured data,  
unstructured data,  
audio,  
video,  
and more.

Big data raises two challenges: **storage** and **analysis**.

- one solution: **Hadoop**

## Now What?

- Use the DBMS  
to help manage your company  
or business