Information System Architectures
Weeks 10, 11

• **Questions:**
  - What is an information system architecture?
  - What alternatives are available?
  - What are tradeoffs among alternatives?
  - How would one choose?
  - What complicates architectures description/decisions?
  - What alternatives are prevalent in different circumstances?

• **Plan**
  - Monday – Architectures and Alternatives
  - Wednesday – Tradeoffs among architectures
  - Friday – Prevalent architectures and complicating factors

  — *Project – Providing recommendations about alternative...*
Information System Architectures
Warm-up

- **Challenge:** How to support students in finding open courses during registering?

- **Assume:**
  - Course registration information is stored on a database that the university maintains.
  - SQL query required is simple, something like…

```sql
SELECT courseName, allowableEnrollment-currentlyEnrolledCount as openSlots
FROM courseEnrollments
WHERE currentlyEnrolledCount < allowableEnrollment
```
Information System Architectures
Warm-up

• What are possible strategies by which user could get a response?

• What type of architecture does each strategy represent?
Information Systems “Architectures”

**Architecture:** A specific configuration of hardware and software to accomplish the major components of a computing system. The major components are...

- **Input/Output:** Responsible for
  - Formatting and presenting data on the user’s screen or other output device,
  - Managing user input from a keyboard or other input device.

- **Processing:** Responsible for processing done to use data, such as
  - Data processing logic (e.g., data validation & identification of errors),
  - Business rules logic (specifically rules not coded at the DBMS level), and
  - Data management logic (identifying data for processing transaction or query).

- **Storage:** Includes for
  - Responsibility for data storage in from the physical storage
  - Responsibility for data retrieval from the physical storage
  - Actual data

*Observation* – “Approach” from the previous list illustrates different architectures...
Stand-alone Architecture

• **Explanation:**
  - Single computer handles all components

• **Example:**
  - Give users a copy of database and database software
  - Give users a copy of a special course registration software application and the database…(everything local)
Client Server Architecture

• **General Description:** A networked computing model that distributes components between clients, which request services, and servers, which supply the requested services.
  
  – **Client:**
    • The machine with which user interacts (local machine)
    • Sends a message to a server requesting that the server perform a task
  
  – **Server:**
    • A machine that performs tasks at the request of a client.
    • A shared resource…

Different client-server architectures stem from different distributions of responsibilities across clients and servers.
Client-Server 1: File Server

- **General:**
  - Server is responsible for storing files
  - Client is responsible for everything else
    - Processing (applications, DBMS) and
    - Input and output

- **Examples**
  - Put the database on a file server and let students interact with it using a copy of the DBMS (e.g., Access).
Client-Server 2: Database Server Only

- General:
  - Server contains database and software for interacting with data (DBMS)
  - Client is responsible for special application programs and for I/O

- Examples
  - A command line interface permits students to directly ask questions of the DMBS
  - A local application sends data requests to database server
  - Similar to calling a database administrator and telling them example what SQL query to execute.
Client-Server 3: Three-tier Architecture

• General:
  – Two servers: one to manage data, one to handle applications between user and data.
  – Client is responsible for I/O
  – Note: Three tiered b/c (1) client, (2) application server, and (3) data server

• Examples
  Similar to having users call an information line through which they can state their question and the person at the other end will provide the answer.
Client-Server 3b: Web Architecture

- **General:** A form of 3-tier architecture
  - Web server – processes input from browser, creates pages
  - Data server – provides data to web server, holds data
  - Client - Browser is client, manages display

- **Example...**

  *Current system on university website...*
Information System Architectures
Closure

• Summary – Types of Architectures:

• For Wednesday:
  – Explore tradeoffs between architectures
  – HW: Readings guided by class preparation survey