
SYSTEM DESIGN



Key Definitions

- **Architecture design**

- Plans for how the system will be distributed across computers and what the hardware and software will be used for each computer.

- **Hardware and software specification**

- Describes the hardware/software components in detail to aid those responsible for purchasing those products.

- **Interface**

- The **user interface** defines how the system will interact with external entities.
- The **system interfaces** define how systems exchange information with other systems.

Architectural Components (Functions) of Software

- Data storage
- Data access logic
 - Processing required to access stored data
- Application logic
 - Processing logic of the application
- Presentation logic
 - Information display and user command processing

Architectural Design Purpose

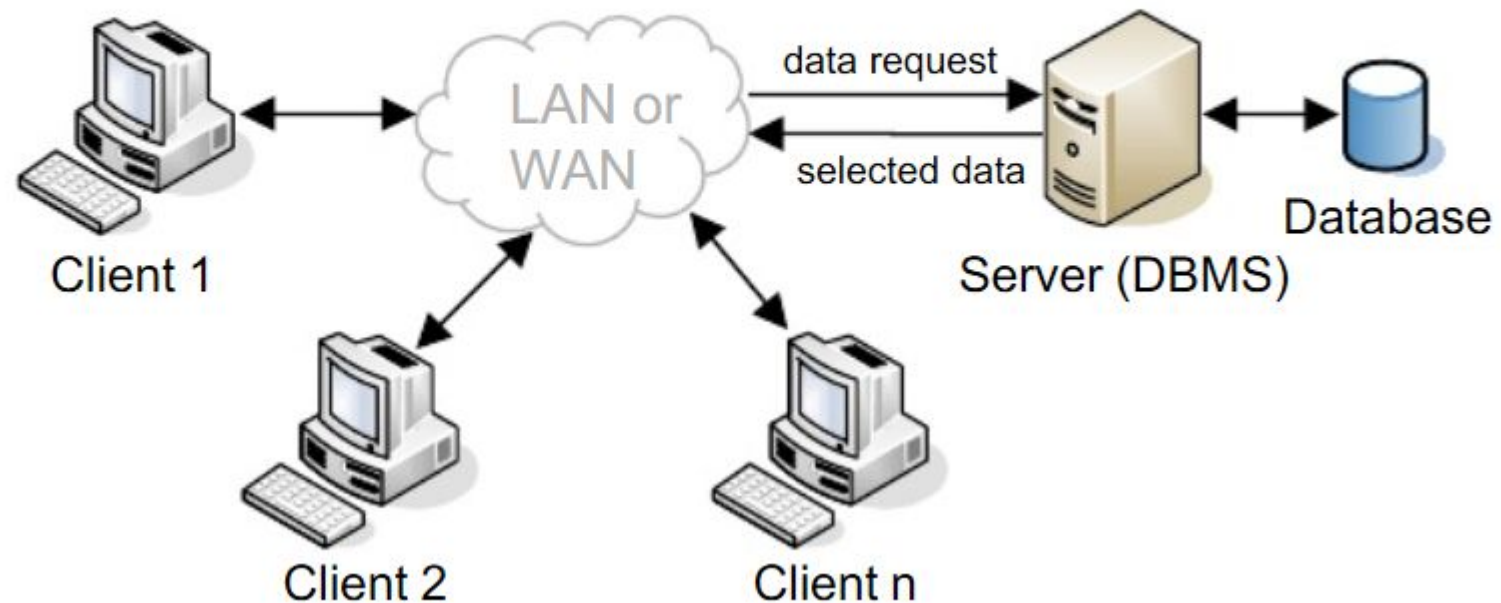
- Determine what parts of the application software will be assigned to what hardware.
- Hardware options:
 - Clients
 - Input/output devices employed by users
 - PCs, laptops, handheld devices, cell phones
 - Servers
 - Larger computers storing software
 - Accessible by many users

Client-Server Architectures



Client-Server Architecture (Two-Tiered)

1 Two-Tier Client-Server Architecture



Client-Server Attributes

BENEFITS

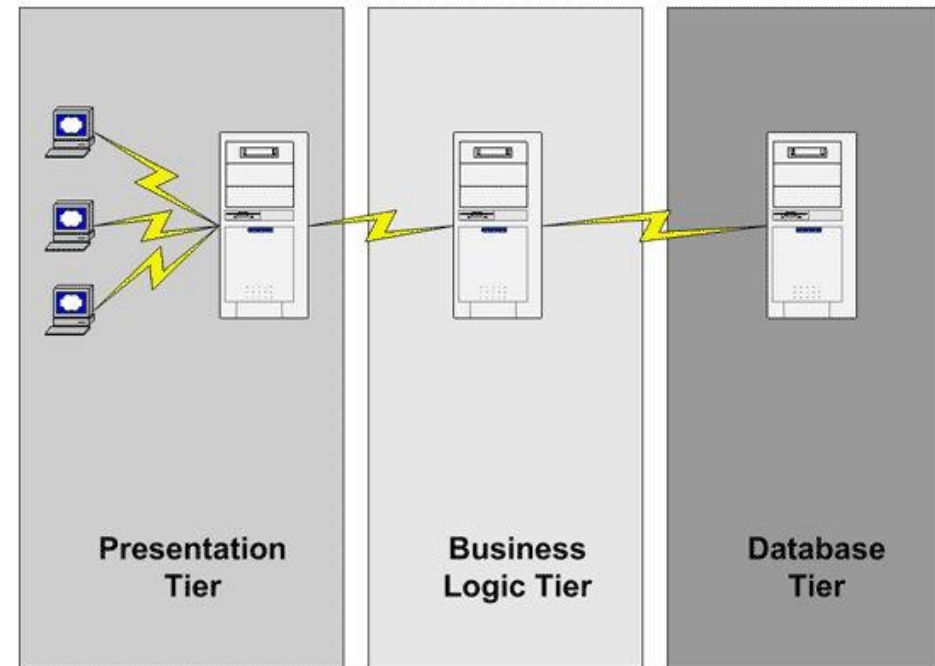
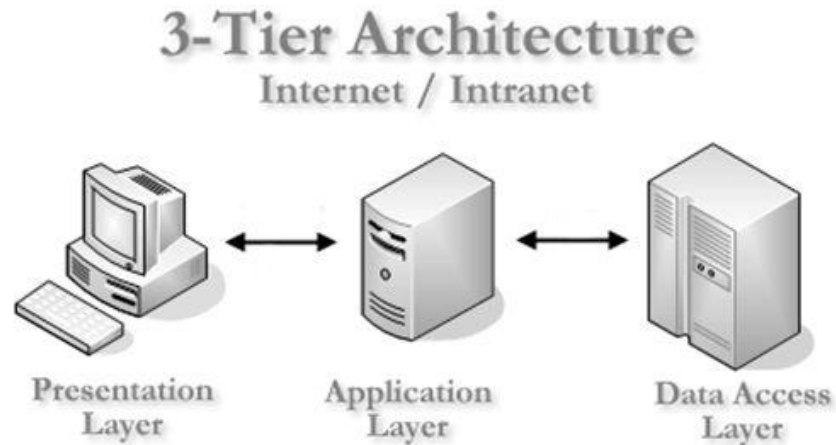
- Scalable
- Works with multiple vendors/products through middleware
- Improved modularity of web-based systems
- No central point of failure

LIMITATIONS

- Complexity
- New programming languages and techniques (adds stress for personnel)
- More complex to update

Three-Tiered Client-Server Architecture

- In 3-tier architecture, an application is virtually split into three separate logical layers



N-Tiered versus 2-Tiered Client-Server Architectures

BENEFITS

- Separates processing to better balance load on different servers.
- More scalable.

LIMITATIONS

- Greater load on the network
- More difficult to program and test

Factors in Hardware and Software Selection

- **Functions and Features** – What specific functions and features are needed (size of monitor, software features ...)
- **Performance** – How fast the hardware and software operates (processor, number of database writes per second ...)
- **Legacy database and systems** – How well the hardware and software interacts with legacy systems (can it writes to this database ...)
- **Hardware and OS strategy** – What are the future migration plan
- **Cost of ownership** – What are the cost beyond purchase (incremental license cost, annual maintenance, training cost ...)
- **Vendor performance**

User interface



Key Definitions

- The **navigation mechanism** provides the way for users to tell the system what to do.
- The **input mechanism** defines the way the system captures information.
- The **output mechanism** defines the way the system provides information to users or other systems.

Principles for user interface design

- **Layout Concepts**

- The screen is often divided into three boxes.
 - Navigation area (top)
 - Status area (bottom)
 - Work area (middle)
- Information can be presented in multiple areas.
- Like areas should be grouped together

Principles for user interface design

- **Layout Concepts**

- Areas and information should minimize user movement from one to another.
- Ideally, areas will remain consistent in
 - Size
 - Shape
 - Placement for entering data
 - Reports presenting retrieved data



Julie Elaine Johnson

Director, Demand Generation

Request a Change



Personal Pay Info Job Benefits Time off Documents Notes Training More ▾


Personal

Reorder Fields

Basic Information

Employee # Status

Name Nickname

Birth Date  Age: 63

SSN


Address

Save Changes

Cancel

Powered by 

 801-763-1893 Ext. 6109

 801-344-1998



Hire Date

Aug 28, 2009

4y - 2m - 10d

 Full time

 Engineering

 Seattle, WA

Manager



Daniel Hendricks
VP, Marketing

Direct Reports



Alan Nguyen

Principles for user interface design

- Content Awareness
 - All interfaces should have titles.
 - Menus should show where you are where you came from to get there.
 - It should be clear what information is within each area.
 - Fields and field labels should be selected carefully.
 - Use dates and version numbers to aid system users.

Thông tin chung

Thông tin mở rộng

Chức năng hỗ trợ

Số phiếu *

HDBHCT03-0015

Ngày lập *

02/03/2010

15

Mã số thuế

Mã tham chiếu

HDBHCT03-0013

Ngày H.Toán *

02/03/2010

15

Tiền tệ *

VND

VND

Tỷ giá *

1

Khách hàng *

KH0080301PHI

Phượng Lộc

Loại chứng từ *

1

Bán hàng công nợ

Địa chỉ

78/4.Đường số 4.KP17.P Bình Hưng Hòa

Diễn giải

CN 15 ngày

Dẫn xuất



Thông tin chi tiết

			Mã sản phẩm	Tên sản phẩm	Tên ĐVT	Size	L	Lô	StoreName	Promotion	C
1			GIAYCARD4507	Giấy card đen ĐL 450(79 x	Tờ	0.86		T00:00:00+07:00	KHO HÀNG HOÁ C	<input type="checkbox"/>	
2			GIAYIVORY 79X	Giấy ivory ĐL250g(79 x 10'	tờ	0		T00:00:00+07:00	KHO HÀNG HOÁ C	<input type="checkbox"/>	

☐ Sửa số tiền

Tiền hàng

672,500

Quy đổi:

672,500

☐ Tính thuế trước CK

Tiền chiết khấu

0

0

Tiền sau chiết khấu

672,500

672,500

Tiền thuế

0

0

Tổng tiền thanh toán

672,500

672,500

Thêm

Sửa

Xóa

In

Lưu

Ngôn ngữ

Trợ giúp

Thoát

Principles for user interface design

- **Aesthetics**
 - Interfaces need to be functional and inviting to use
 - Avoid squeezing in too much, particularly for novice users
 - Design text carefully
 - Be aware of font and size
 - Avoid using all capital letters

Principles for user interface design

- **Aesthetics**

- Colors and patterns should be used carefully
 - Test quality of colors by trying the interface on a black/white monitor
 - Use colors to separate or categorize items

Principles for user interface design

- Three clicks rule
 - Users should be able to go from the start or main menu of a system to the information or action they want in no more than three mouse clicks or three keystrokes.

NAVIGATION DESIGN

- Basic Principles of Navigation Design
 - Assume users
 - Have not read the manual
 - Have not attended training
 - Do not have external help readily at hand
 - All controls should be clear and understandable and placed in an intuitive location on the screen.

NAVIGATION DESIGN

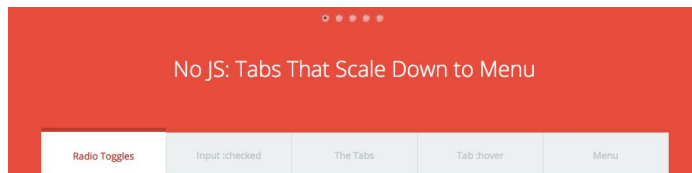
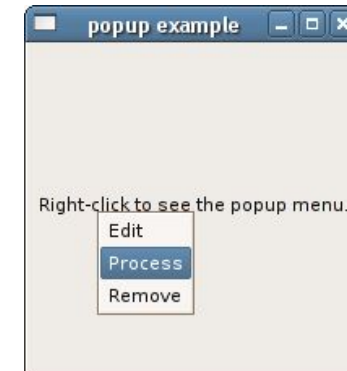
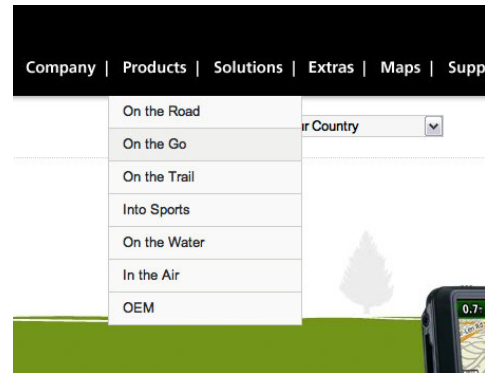
- Basic Principles of Navigation Design
 - Prevent mistakes
 - Limit choices
 - Never display commands that can't be used (or “gray them out”)
 - Confirm actions that are difficult or impossible to undo
 - Simplify recovery from mistakes
 - Use consistent grammar order

NAVIGATION DESIGN

- Types of Navigation Control
 - Languages
 - Command language
 - Natural language
 - Menus
 - Generally aim at broad shallow menu
 - Consider using “hot keys”
 - Direct Manipulation
 - Used with icons to start programs
 - Used to shape and size objects
 - May not be intuitive for all commands

NAVIGATION DESIGN

■ Types of Menus

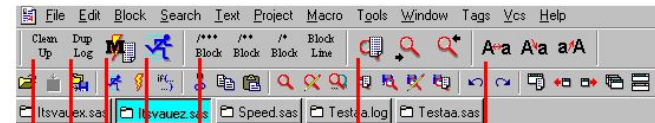


Radio Toggles

In this demo, `labels` for hidden `radios` toggle the content. This is based on the behavior in which clicked `labels` for a `radio` or `checkbox` input will check that `input`.

```
<input id="radio-1" type="radio" name="demo-radios">
<input id="radio-2" type="radio" name="demo-radios">
```

#radio-1: ☐ #radio-2: ☐



Change case dialog, lowercase selected string, uppercase selected string

Find currently selected string, all, forward, and back

Block Comments, 3', 2', 1' and current line

Run SAS on current file

Make selected text into a macro

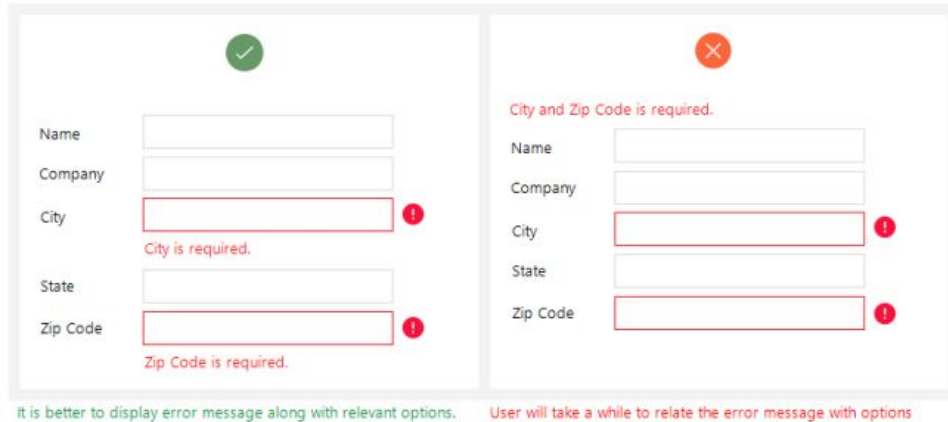
Make a backup of the log file for current file

Delete log and output files for current file

Message tips

- Should be clear, concise, and complete
- Should be grammatically correct and free of jargon and abbreviations
- Avoid negatives and humor

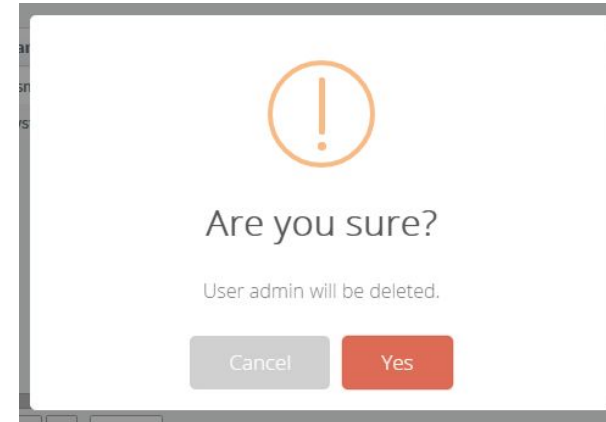
Types of Messages



The image shows two side-by-side form examples. The left form, marked with a green checkmark, displays error messages directly below the relevant input fields: 'City is required.' under the City field and 'Zip Code is required.' under the Zip Code field. The right form, marked with a red 'X', displays a single error message at the top: 'City and Zip Code is required.', which is not directly associated with the specific fields. Below the forms, a green caption reads 'It is better to display error message along with relevant options.' and a red caption reads 'User will take a while to relate the error message with options'.

It is better to display error message along with relevant options.

User will take a while to relate the error message with options



A confirmation dialog box with a large orange exclamation mark icon. The text inside reads 'Are you sure?' followed by 'User admin will be deleted.' At the bottom are two buttons: 'Cancel' (grey) and 'Yes' (red).

78%



Please wait while the application is loading...



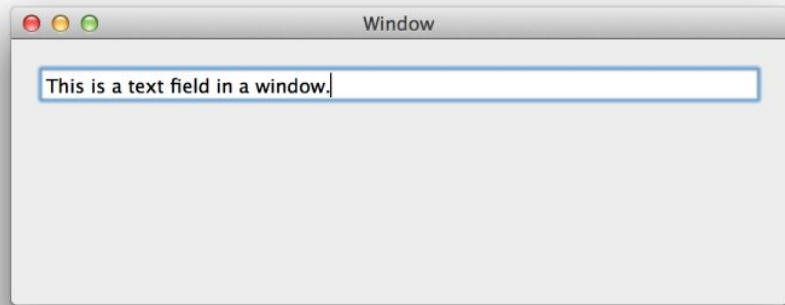
Input design

- The goal is to simply and easily capture accurate information for the system
- Reflect the nature of the inputs
- Find ways to simplify their collection
- **Online processing** immediately records the transaction in the appropriate database
- **Batch processing** collects inputs over time and enters them into the system at one time in a batch

Input design

- Minimize Keystrokes
 - Never ask for information that can be obtained other ways
 - Lookups
 - Dropdown lists
 - Default values

Types of inputs



* Entry

.....

3

Preset Value 1 ▾

Value 1 ▾

Enter a custom value:

Cancel Done

Add Custom Value

ComboBox (o7planning.org)

Select Planet: Venus ▾

Mercury

Venus

Earth

	Checkbox	Radio	Switch
On	<input checked="" type="checkbox"/>	<input checked="" type="radio"/>	<input checked="" type="checkbox"/>
Off	<input type="checkbox"/>	<input type="radio"/>	<input type="checkbox"/>

Flying from

Lexington, KY (LEX-Blue Grass)

Flying to

Faro, Portugal (FAO-Faro Intl.)

Departing

10/21/2016

Returning

10/21/2016

Adults (18+)

1

Children (0-17)

0

Advanced options

☐ Add a hotel ☐ Add a car

Search

OCT 2016

S	M	T	W	T	F	S
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31					

NOV 2016

S	M	T	W	T	F	S
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30			

Close

Output design

- Understand report usage
 - Reference or cover-to-cover?
 - Frequency?
 - Real-time or batch reports?
- Manage information load
 - All needed information, no more
 - Minimize bias

Types of reports

print_logs_by_group.pdf - Adobe Reader

File Edit View Document Tools Window Help

1 / 8 100%

PaperCut™

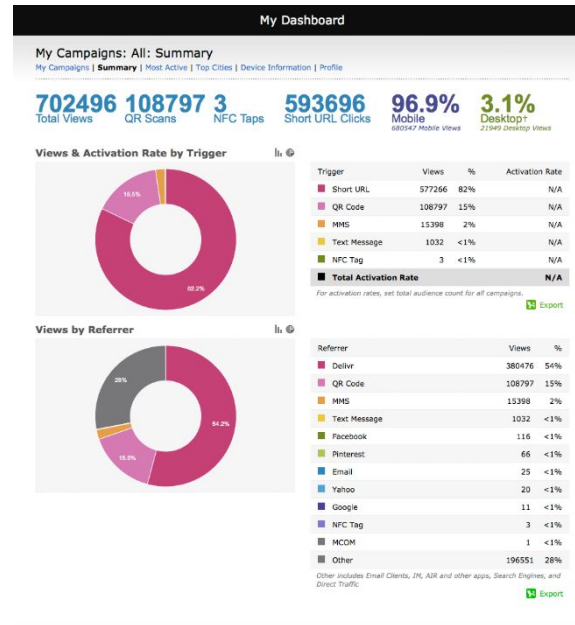
Group printing - logs

For the period of May 25, 2007 to May 31, 2007

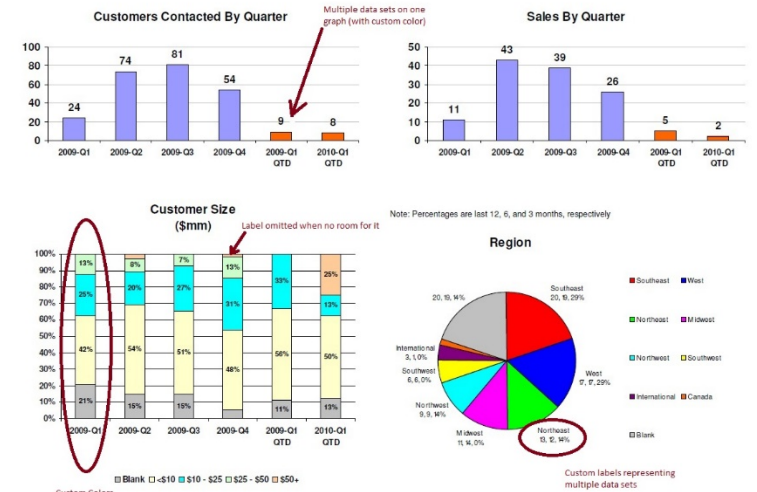
Date	Printer	Username	Document	Pages	Cost	Allowed	Attributes
Group: Building 201							
May 31, 2007 8:36:46 AM	Win2003HP LaserJet SMP	matt	Awesome Presentation - OpenOffice.org Impress	280	\$28.00	Yes	FOOLSCAP, Duplex: Yes, Grayscale: Yes, Copies: 4, 57579KB, Library2, EMF, A3 (ISO_A3), Duplex: Yes, Grayscale: Yes, 19072KB, Library1, Postscript, A4 (ISO_A4), Duplex: No, Grayscale: No, 2519KB, Office1, Postscript, LETTER (ANSI_A), Duplex: No, Grayscale: No, 82682KB, Office1, EMF, A4 (ISO_A4), Duplex: No, Grayscale: Yes, Copies: 4, 92359KB, Library1, EMF, A4 (ISO_A4), Duplex: Yes, Grayscale: Yes, Copies: 3, 8208KB, Server, EMF, FOOLSCAP, Duplex: Yes, Grayscale: No, 93639KB, Office1, PCL, A5 (ISO_A5), Duplex: No, Grayscale: Yes, Copies: 2, 70041KB, 192.168.1.1, EMF, LEGAL, Duplex: Yes, Grayscale: Yes, Copies: 2, 67972KB, Office2, Postscript, LEGAL, Duplex: Yes, Grayscale: Yes, 54938KB, Office2, PCL, LEGAL, Duplex: Yes, Grayscale: Yes, 93924KB, Library2, EMF
May 30, 2007 10:57:29 AM	printserver/Canon BJ 2000	kate	Untitled1 - OpenOffice.org Writer	3	\$0.30	Yes	
May 29, 2007 10:29:03 PM	linusserver/HP LaserJ	kate	Budget - OpenOffice.org Calc	67	\$6.70	Yes	
May 28, 2007 4:06:03 PM	printserver/Xerox Color 1930	mary	research paper.pdf	39	\$3.90	Yes	
May 28, 2007 12:32:13 PM	linusserver/Xerox Color 1930	matt	Stats - OpenOffice.org Writer	68	\$6.80	Yes	
May 27, 2007 3:18:37 AM	Win2003HP LaserJ	kate	Awesome Presentation - OpenOffice.org Impress	9	\$0.90	Yes	
May 26, 2007 8:50:44 PM	macserver/HP LaserJet SMP	mary	Untitled1 - OpenOffice.org Writer	62	\$6.20	Yes	
May 26, 2007 3:14:02 PM	Win2003HP LaserJet SMP	matt	Awesome Presentation - OpenOffice.org Impress	64	\$6.40	Yes	
May 26, 2007 2:46:09 AM	Win2003Xerox Color 1930	chris	PaperCut Software - Mozilla Firefox	2	\$0.20	Yes	
May 25, 2007 6:20:40 PM	Win2003HP LaserJet SMP	kate	Budget - OpenOffice.org Calc	74	\$7.40	Yes	
May 25, 2007 1:59:06 AM	Win2003John's Printer	chris	Awesome Presentation - OpenOffice.org Impress	64	\$6.40	Yes	
Totals for group "Building 201":				732	\$73.20		

Page 1 / 8

11.69 x 8.26 in



Your Company Name
Sales Summary - All Regions - January 2009 to December 2009



Physical data design



Clustering

- Reduce the number of times storage must be accessed by physically placing like records close together.
 - Intrafile clustering – similar records in a table are stored together
 - Interfile clustering – combine records from more than one table that are typically retrieved together

Indexing

- A minitable that contains values from one or more fields in a table and the location of the values within the table
- Similar to the index of a book.
- For each table, create a unique index that is based on primary key.
- For each table, create an index that is based on foreign key to improve the performance of joins.
- Create an index of fields that are used frequently for grouping, sorting or criteria.

Estimating Storage Size

- Raw data – sum of the average widths of all fields in a table.
- Calculate overhead requirements based on DBMS vendor recommendations
- Estimate initial number of records
- Estimate growth rate of records

Calculating Volumetrics

Field	Average Size (Characters)
Order number	8
Date	7
Cust ID	4
Last name	13
First name	9
State	2
Amount	4
Tax rate	2
Record size	49
Overhead	30%
Total record size	63.7
Initial table size	50,000
Initial table volume	3,185,000
Growth rate/month	1,000
Table volume @ 3 years	5,478,200

