CS3205: HCI in SW Development

Readings:

- Some material on windows and icons are discussed in Section 6.2.2
- Design patterns, Section 12.3

Where Are We?

- We know about…
  - Learning about users and tasks
  - Conceptual models, mental models, metaphors, interaction styles/modes
  - Lo-fidelity prototyping, wire-frames, hi-fidelity prototypes
  - Evaluation basics
- Next we want to get more detailed…
  - Often referred to as “physical” design (even for screen interfaces)

Outline

- Outline:
  - (Reminder) Designing overall UI flow
  - Windows
  - Widgets / Controls

Overall UI Flow

- Major UI elements are probably windows or screens (on handhelds)
  - What are they? How are they organized?
  - Do they "match" users' mental models of how they want to achieve tasks?
  - Compare to SW architecture design
    - Major components and their roles
    - How they're related
    - Save detailed design (inside modules) for later

Goal of Modeling UI Flow

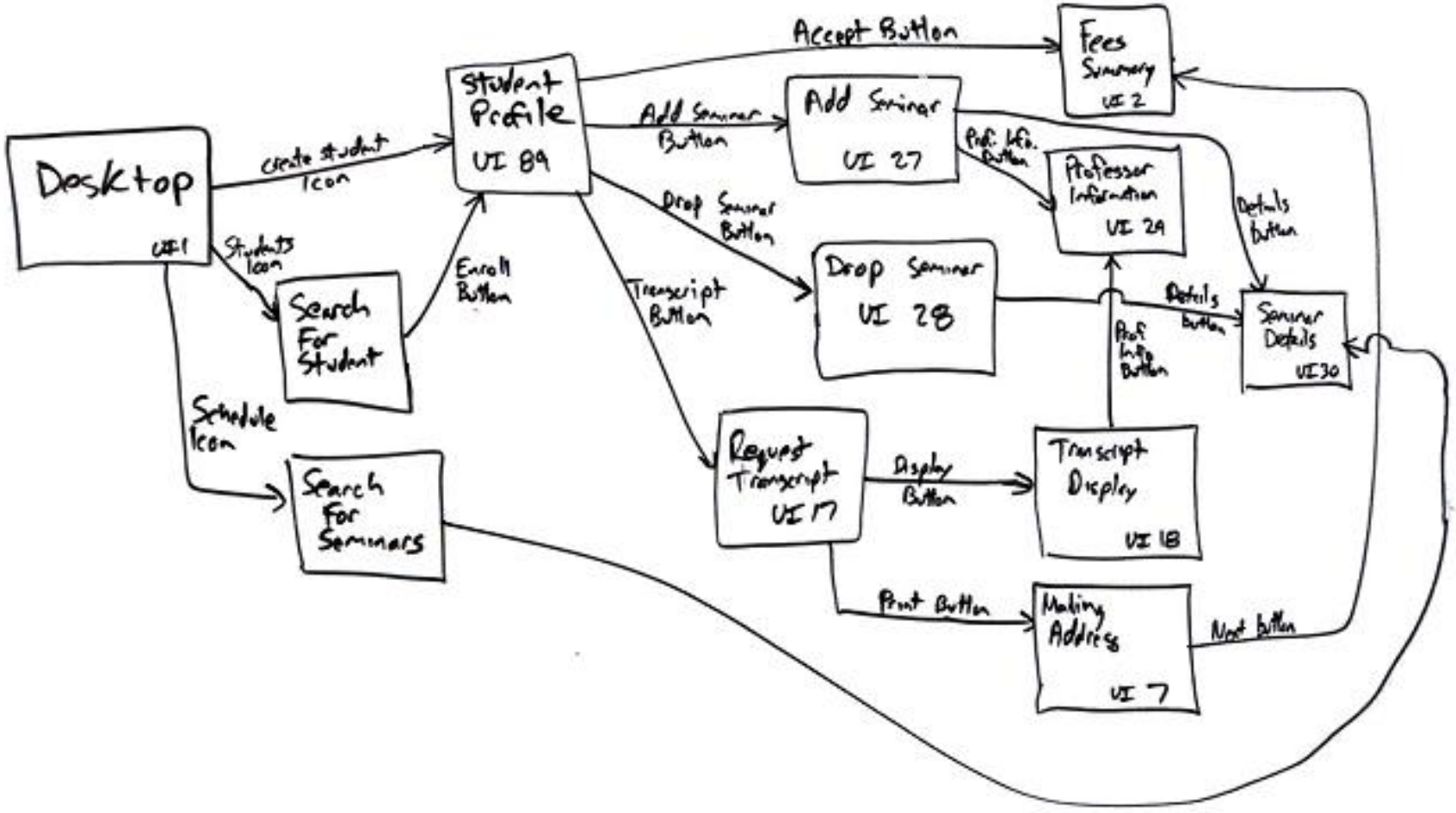
- Identify major UI components (windows)
  - High-level description of their role
- Interactions between these
  - Conditions?

- Two levels possible
  - At conceptual design (more abstract)
  - At physical design (what will be windows)

UI Flow Diagrams

- We can do less than this and still benefit
- Prototype often called a **UI Flow Diagram** or **Navigation Diagram** in the Unified Process methodology
  - Post-its or boxes represent major UI elements (e.g. Windows)
  - Each has a title (or short description) and often an ID
    - ID used to refer to a more detailed diagram (perhaps done later)
- Goals:
  - Get high-level overview
  - Trace through use-cases or scenarios

Example: UI Flow Diagram

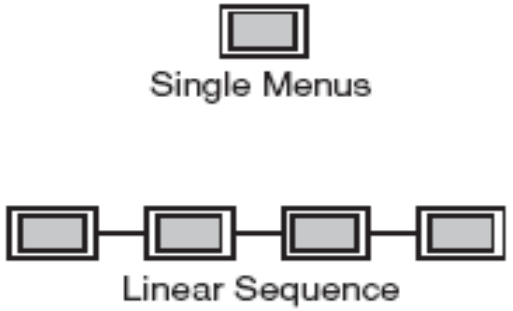


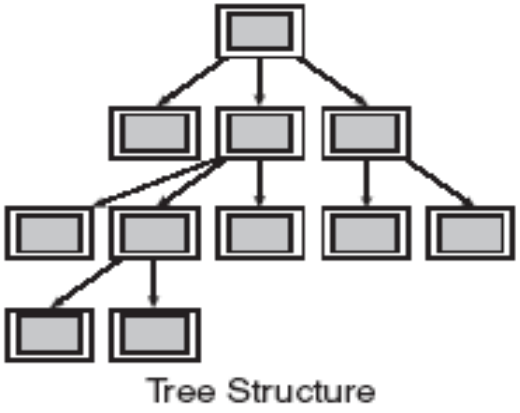
- From: http://www.agilemodeling.com/artifacts/uiFlowDiagram.htm

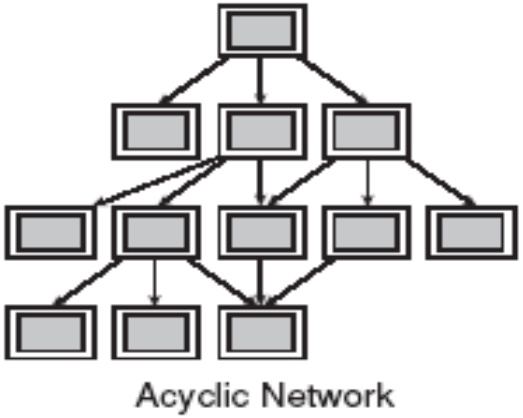
Related Idea: Menu Trees

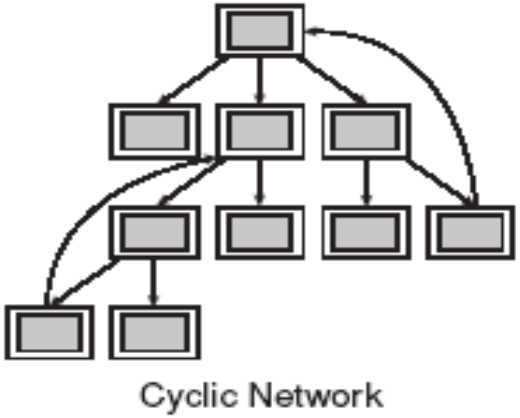
- We can wander through pages, we wander through nested menu items
- Menu trees often used as a form of user documentation
  - You can see how the earlier design representations lead to these
- Forms of menu trees may indicate problems (see next slide)

Forms of Menu Trees

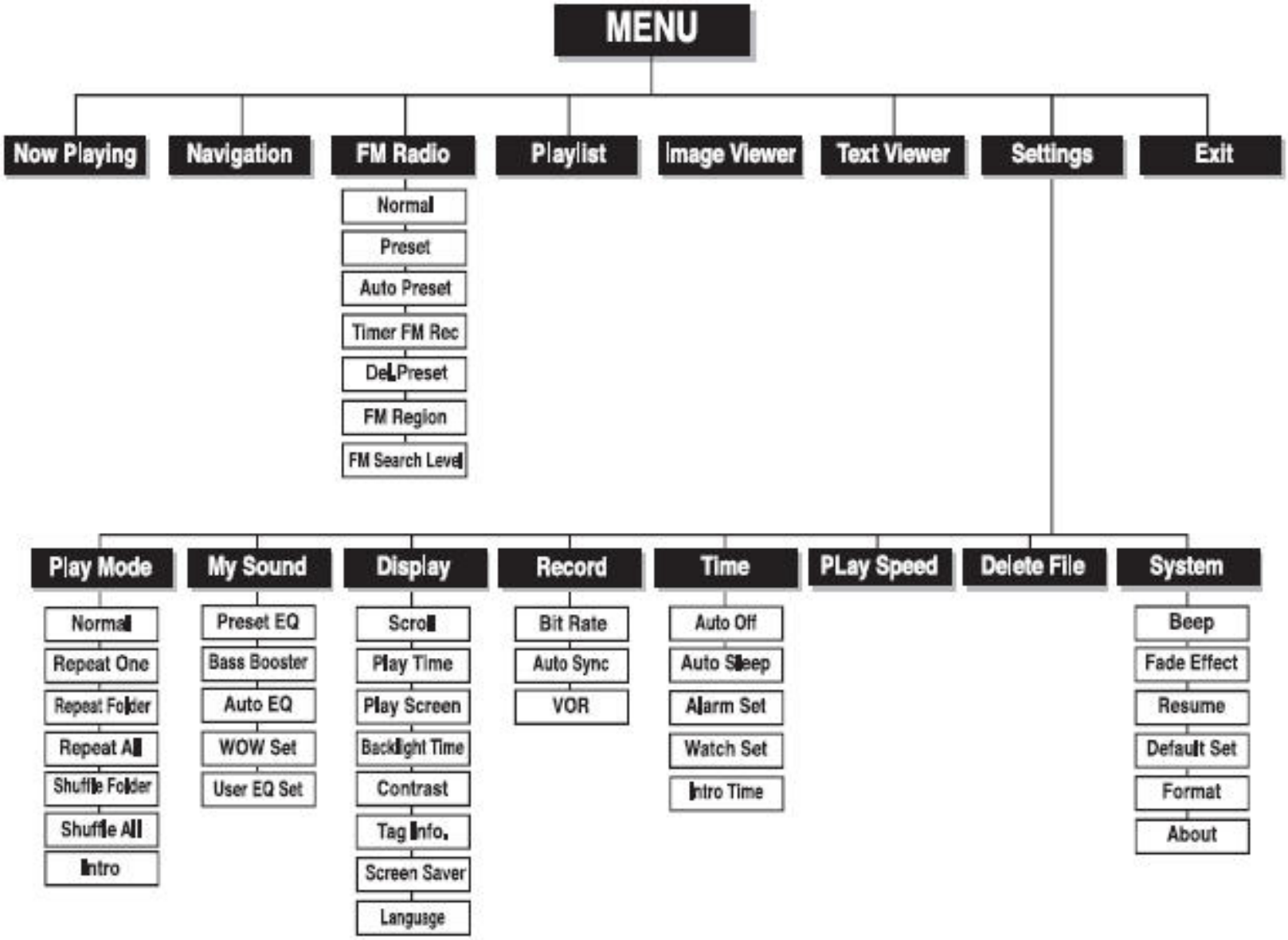








Menu Tree for an MP3 Player



Summary on UI Flow

- Plan overall structure of your major UI elements
  - Windows or screens
  - Menus (problably later)
- Some lo-fi methods are quick and potentially useful
  - If you base these or evaluate these using your scenarios or use-cases

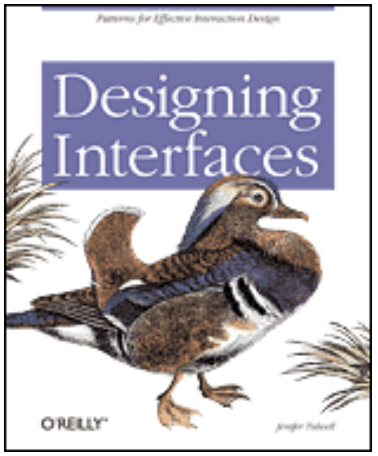
In-Class Exercise

- Diagram something complex or confusing
  - Suggestions about confusing page structure on a web site?
  - Others? Web sites, wikis, apps with deep menus?

UI Patterns

- Find out more:
  - Section 12.3 in ID textbook
  - Website (next)

Book: *Patterns for Effective Interface Design*



- Interesting book!
  - Publisher's site: http://www.oreilly.com/catalog/designinterfaces/index.html
  - Author's page: http://designinginterfaces.com/
    - Samples!
  - Full book available in Virgo through Safari
- Book's goal: document a collection of interface patterns
  - from large-scale idioms to small-scale controls

Sample Chapter Titles

- Information Architecture and Application Structure
- Navigation, Signposts and Wayfinding
- Layout of Page Elements
- Actions and Commands
- Showing Complex Data
- etc.

Example: Organizing Content

- What might the following be?
  - Two-panel selector
  - Center-Stage
  - Extras on demand
  - One-window drill-down
- Examples?

Windows

- We know a lot about these already, eh?
- Primary Windows
- Secondary Windows
  - modal vs. modeless
  - dialog boxes
  - configuration, tabs
- Mouse focus

Organizing a Windowing Interface

A window is a container that designers use to organize the information that users see in an application

- Window interface actions include
  - Open action
  - Close action
  - Resize action
  - Move action
  - Bring forward or activation

Multiple Windows Design

- Advantages
  - Windows optimize the use of limited display space:
    - More information can be accessible
  - Users can use multiple sources on screen simultaneously to complete a task:
    - They give the user freedom to multitask
  - Windowing Systems allow standardization of interfaces across many applications
    - The user moves easily between applications and quickly learns to use new applications.
  - Automatic facilities for organizing window working sets:
    - save time and make large collections of windows easier to manage
  - They lend themselves to direct manipulation

Multiple Windows Design

- Disadvantages:
  - Users perform some tasks slower
    - Due to the need to switch windows
    - Due to getting lost
  - Display screen size and resolution are limitations
  - Time can be lost in rearranging windows
  - User can be confused by user switches context

Windows are like…

- Pages on websites
- Screens on mobile devices
- From a UI design, what's similar? What's different?

Window/Screen design

Two aspects:

- How to split things across screens
  - moving around within and between screens
  - how much interaction per screen?
  - serial or workbench style?
- Individual screen design
  - white space: balance between enough information/interaction and clarity
  - grouping items together: separation with boxes? lines? colors?

Screen design: splitting functions across screens

- Task analysis as a starting point
- Each screen contains a single simple step?
- Frustration if too many simple screens
- Keep information available: multiple screens open at once

Screen design: individual screen design

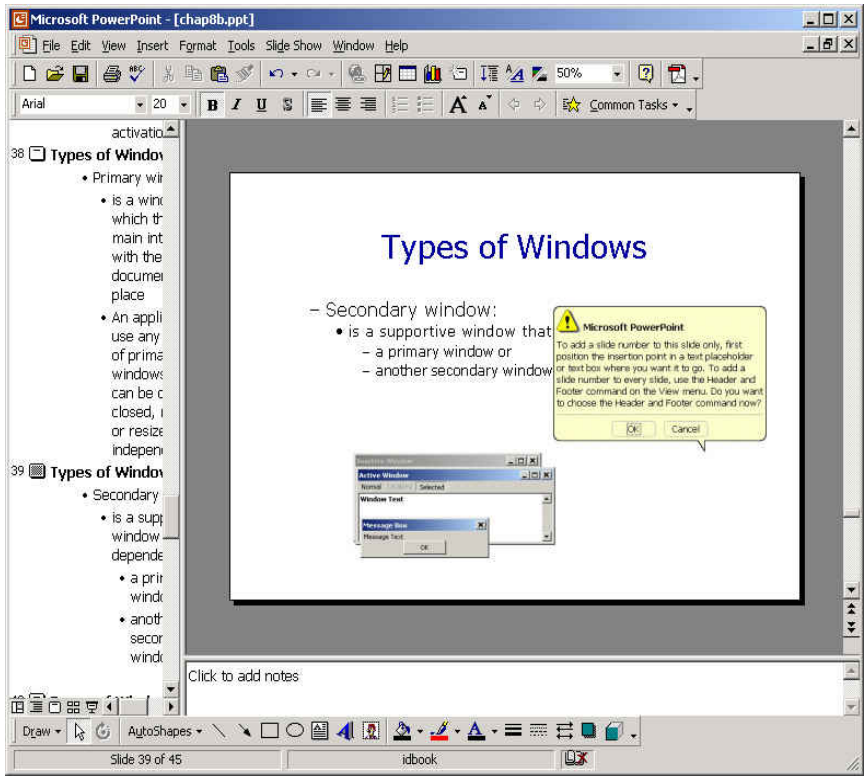
- Draw user attention to salient point, e.g. colour, motion, boxing
- Animation is very powerful but can be distracting
- Good organization helps: grouping, physical proximity
- Trade off between sparse population and overcrowding

Information display

- Relevant information available at all times
- Different types of information imply different kinds of display
- Consistency between paper display and screen data entry

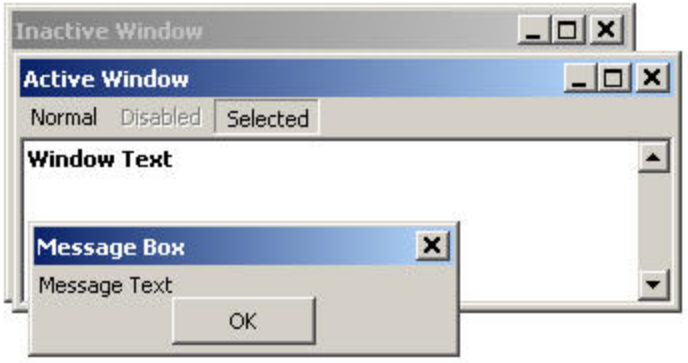
Types of Windows

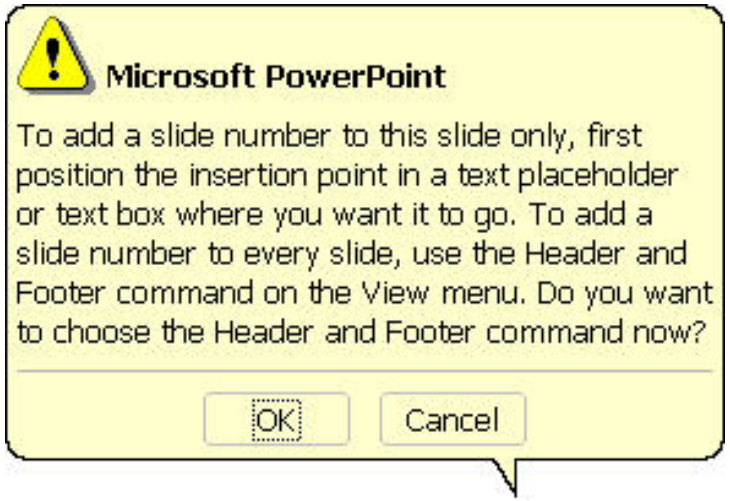
- Primary window:
  - is a window in which the user's main interaction with the data or document takes place
  - An application can use any number of primary windows, which can be opened, closed, minimized, or resized independently



Types of Windows

- Secondary window:
  - is a supportive window that is dependent on
    - a primary window or
    - another secondary window

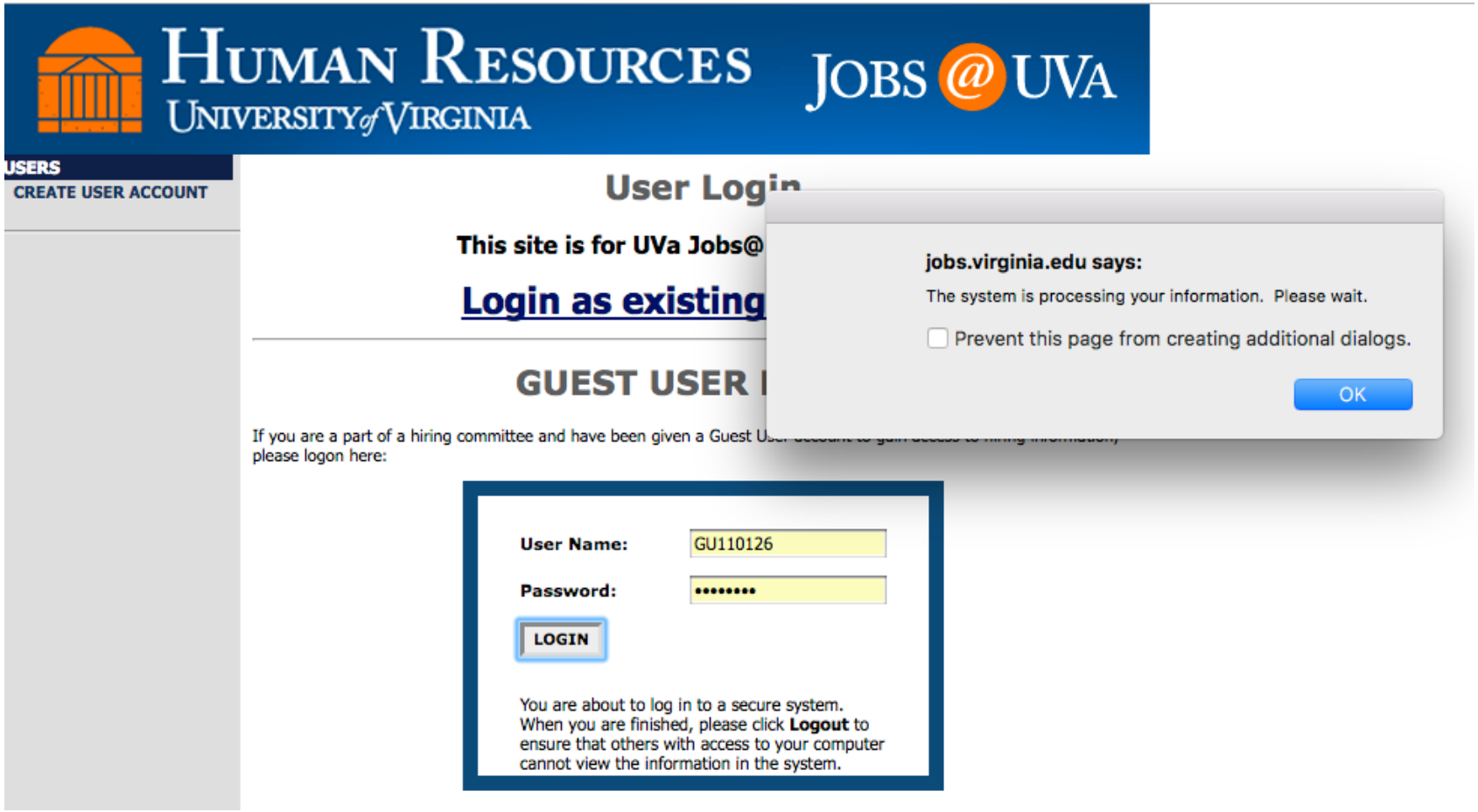




Types of Secondary Windows

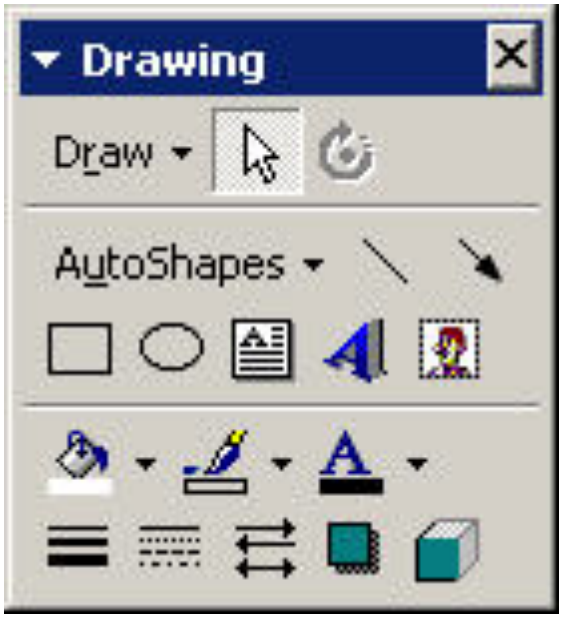
- Message boxes
  - Often **modal:** must exit or OK before continuing
  - Problems?
    - search in Excel; overlapping
- Dialog boxes
  - Enter additional information
  - Sometimes modal, sometimes modeless
    - Comments?

Example of bad text: what does “wait” mean we should do?



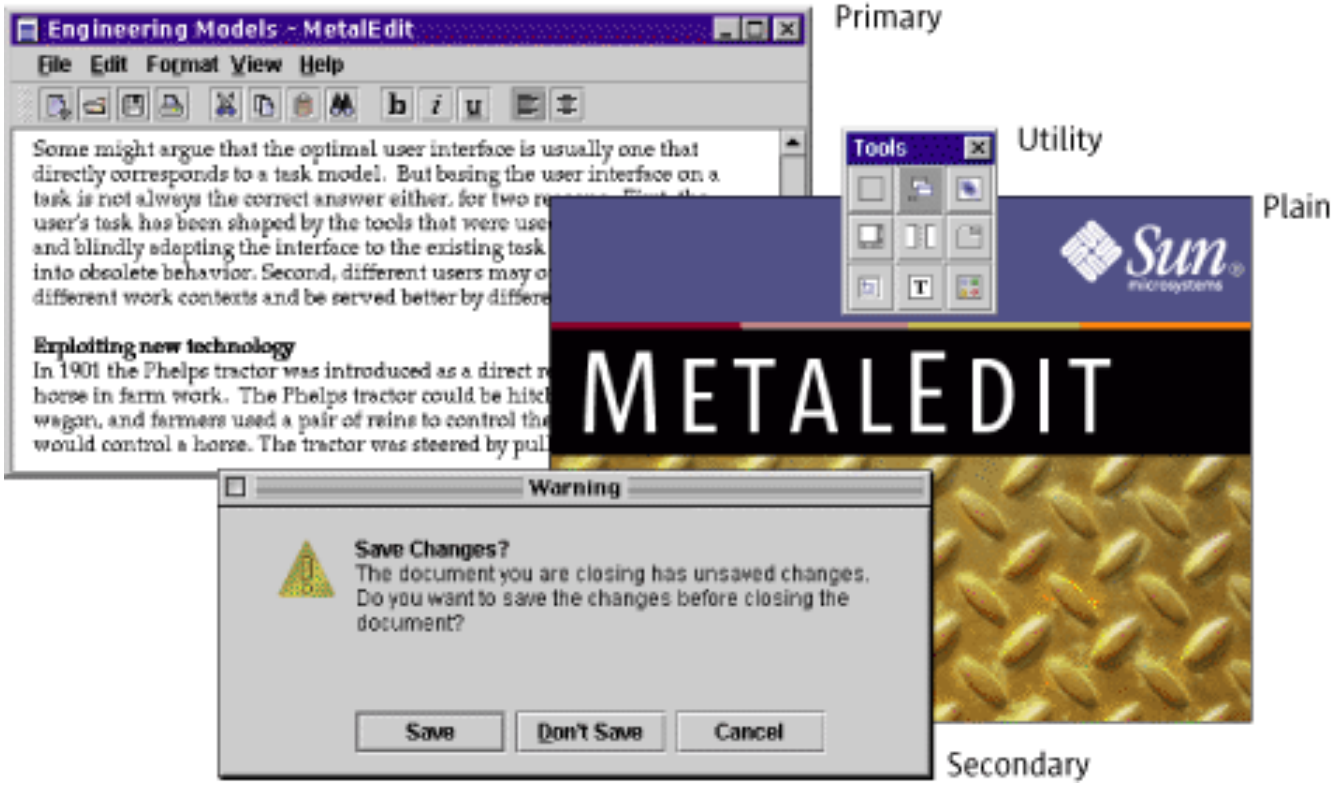
Types of Windows

- Utility window:
  - is a window whose contents affect an active primary window
  - Unlike secondary windows, utility windows remain open when primary windows are closed or minimized.
  - e.g. tool palette that is used to select a graphic tool.



Types of Windows

– Plain window:
  - is a window with no title bar or window controls
  - typically used for splash screens



Wizards

- A **wizard** is really a sequence of dialog boxes to achieve a certain goal
  - Install, configure, etc.
- An example of the *conversational* interaction mode
- Issues to consider:
  - Modal or modeless?
  - Navigation: just next and back, or
  - allow users to see the complete set and jump directly to a screen

Tabs in Windows

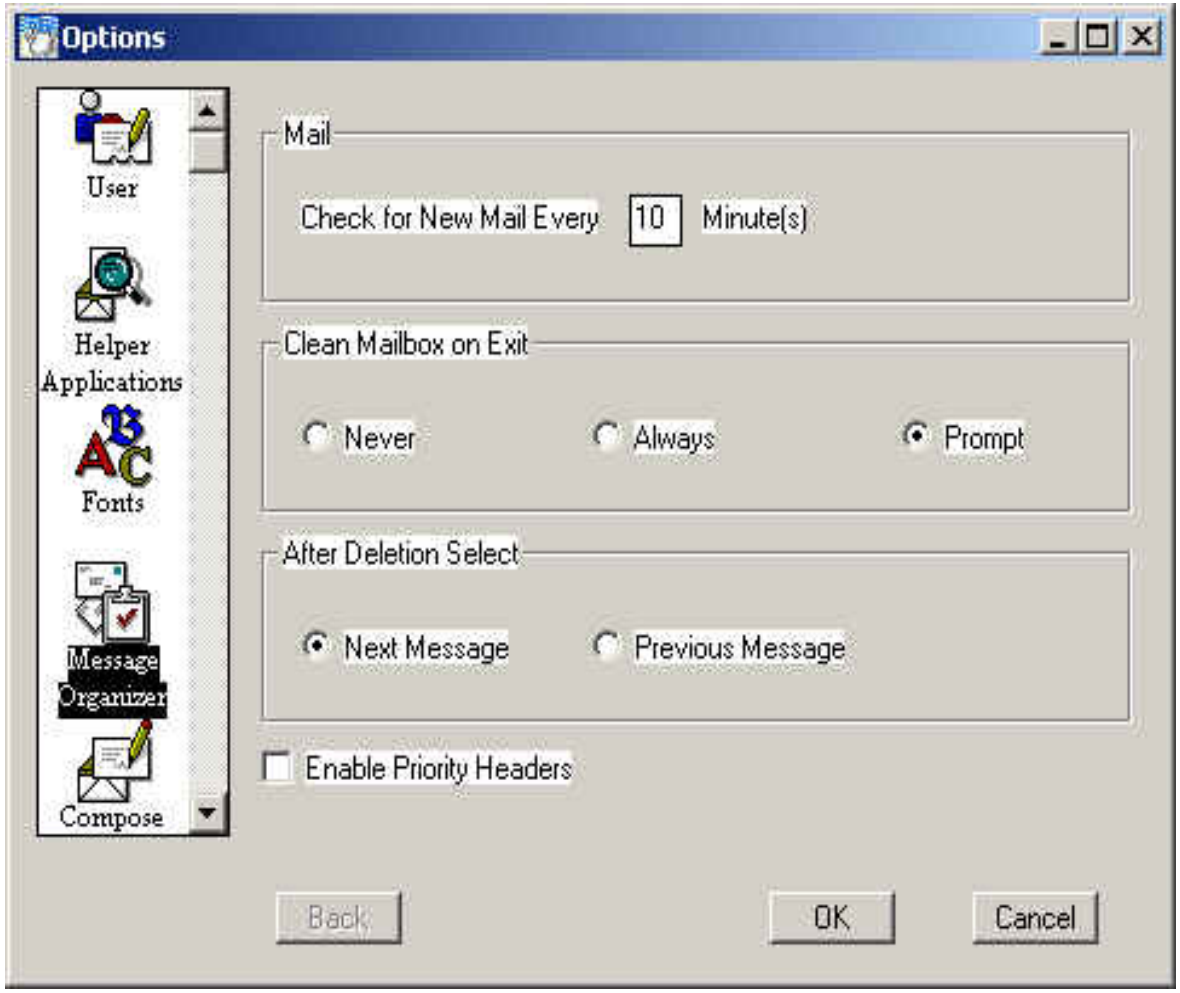
- Why use tabs?
- Irritations?
- Alternatives?

- (See text or reflect on the discussion we had in class)

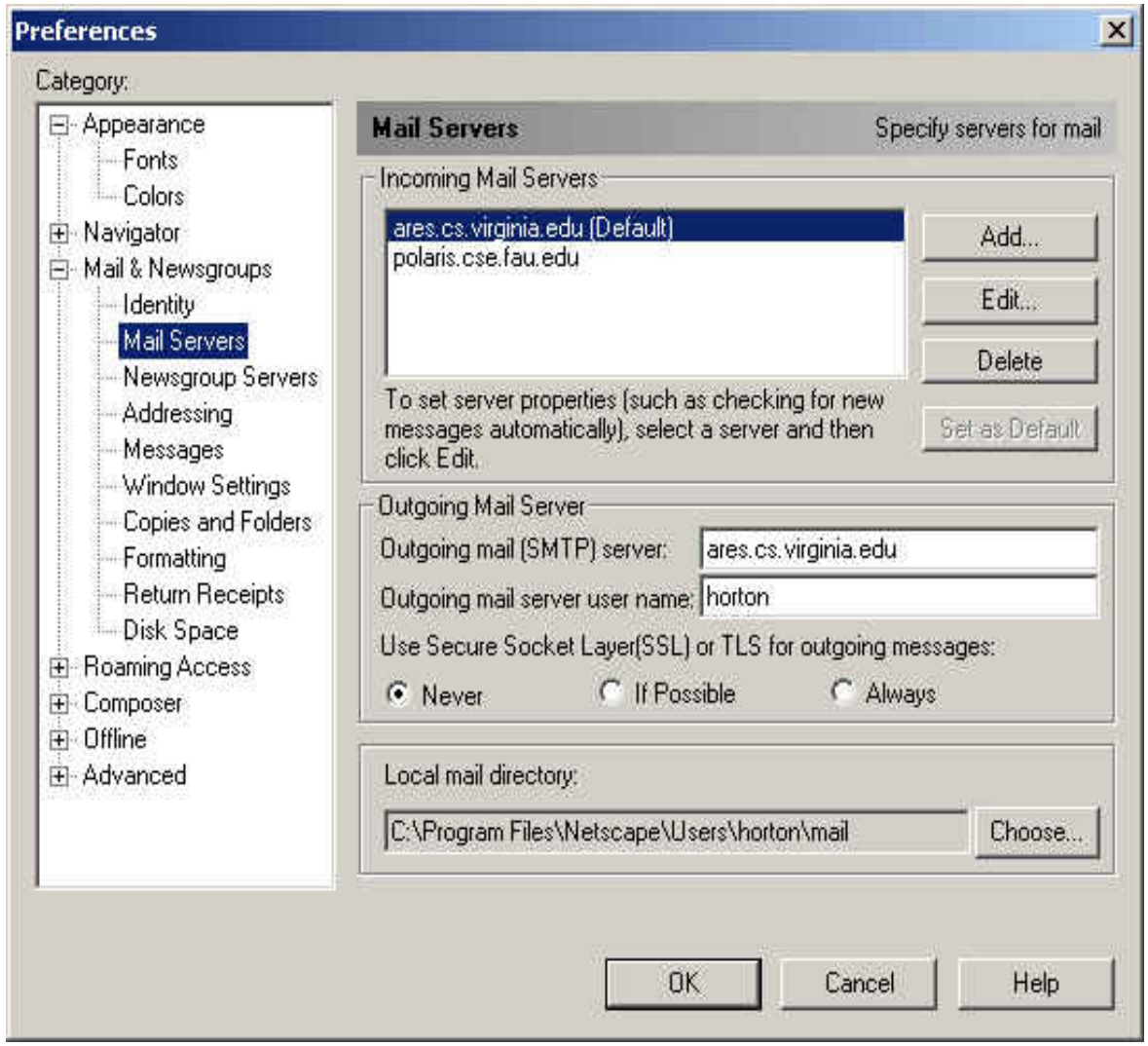
Some Examples

- Following screen shots discussed in class
- Some of these deal with configuration
  - Interesting problem: large number of choices, infrequently used, important for novice and expert
  - Note variety of approaches

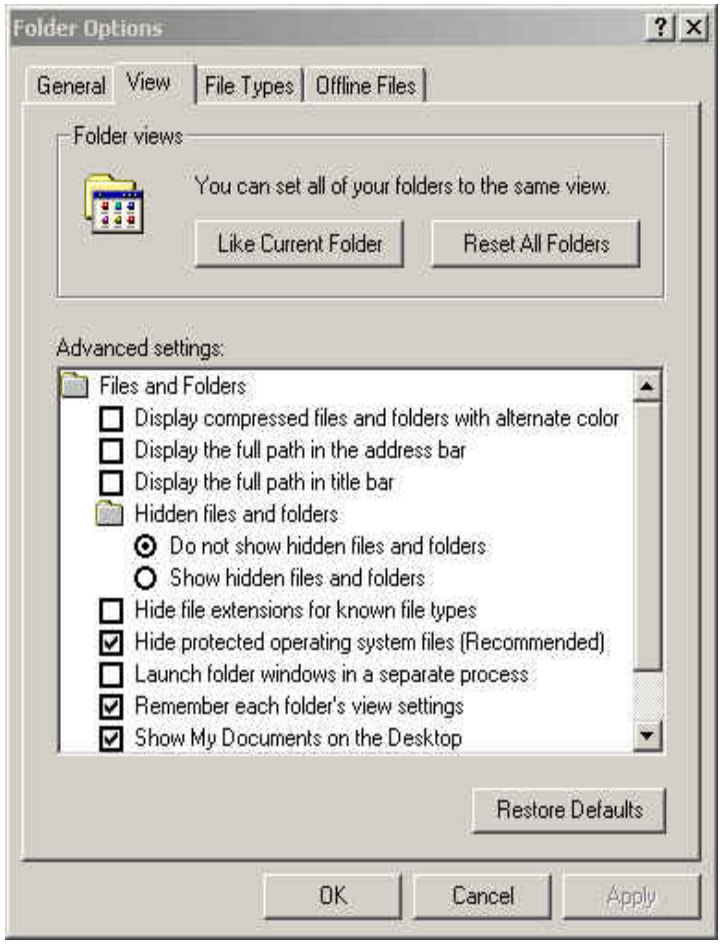
Simeon Options



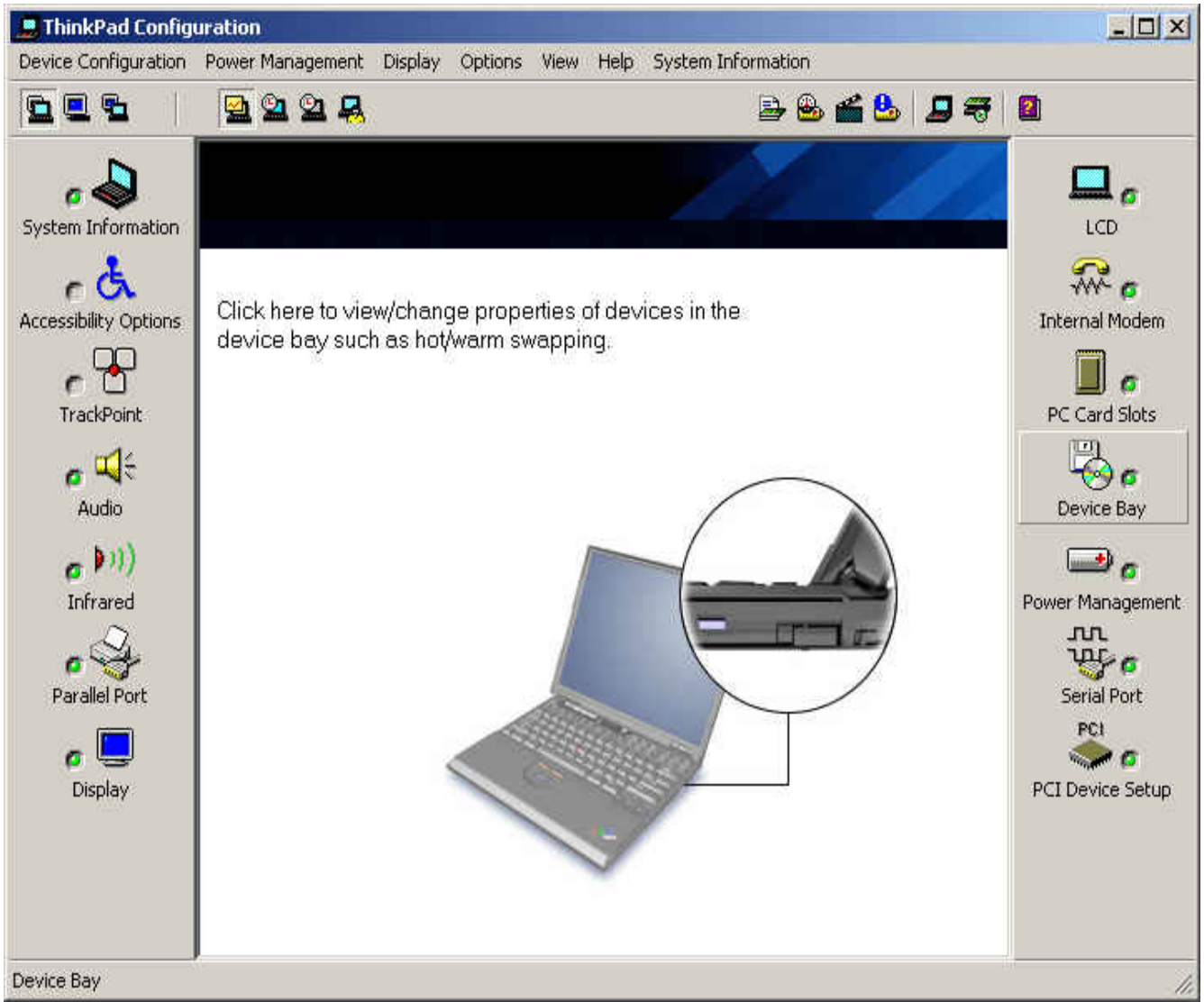
Netscape Preferences



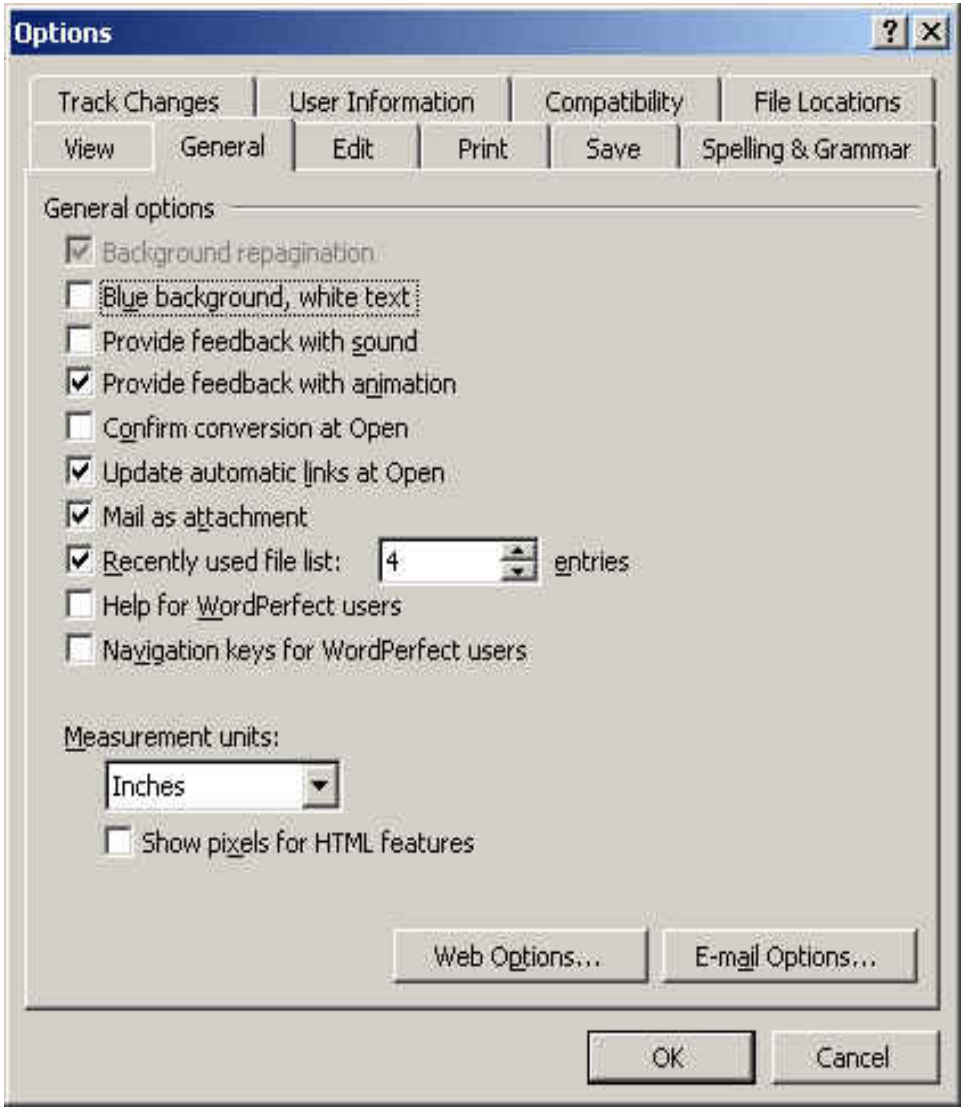
Tabbed Menus



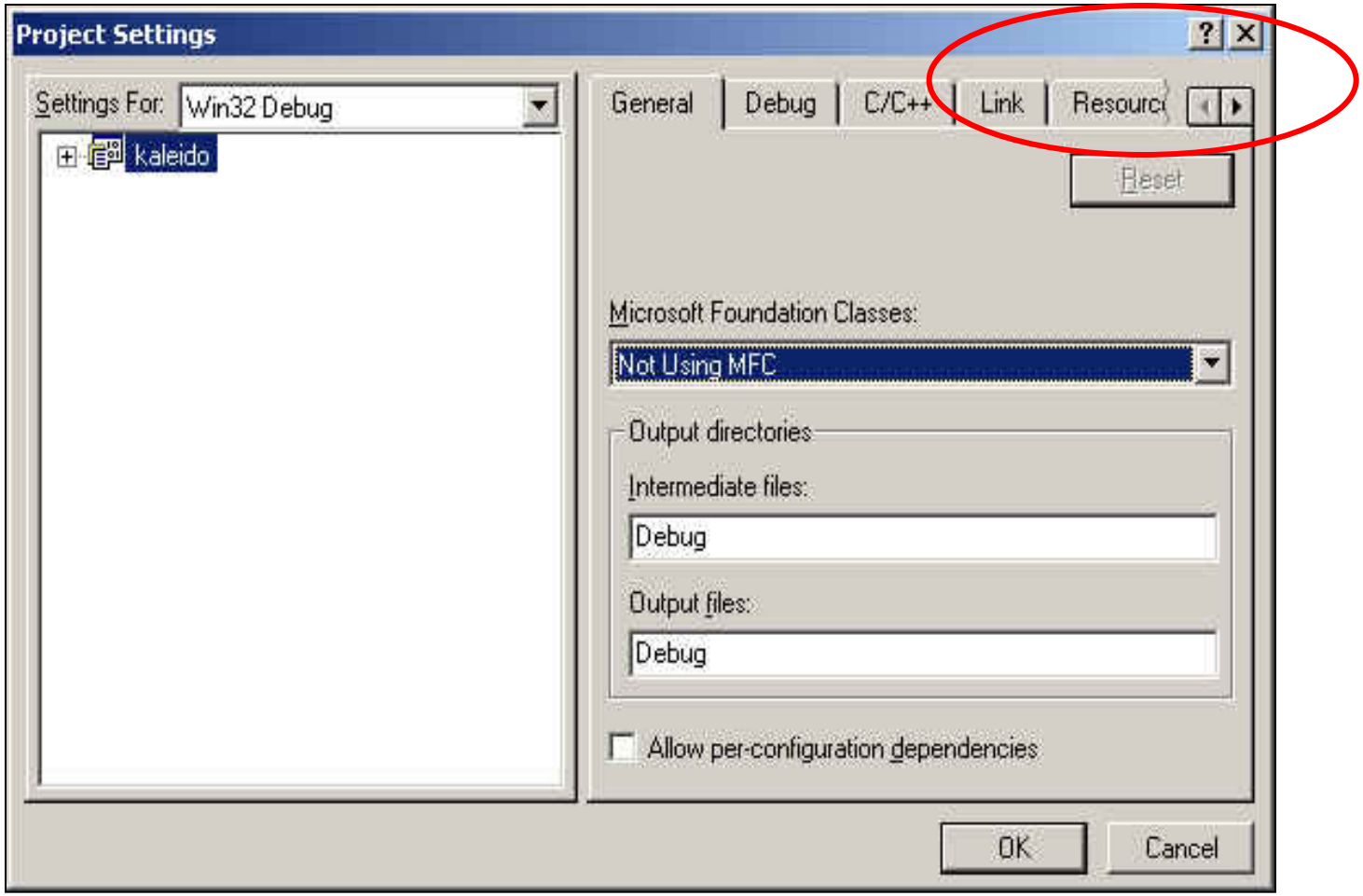
IBM Thinkpad Config



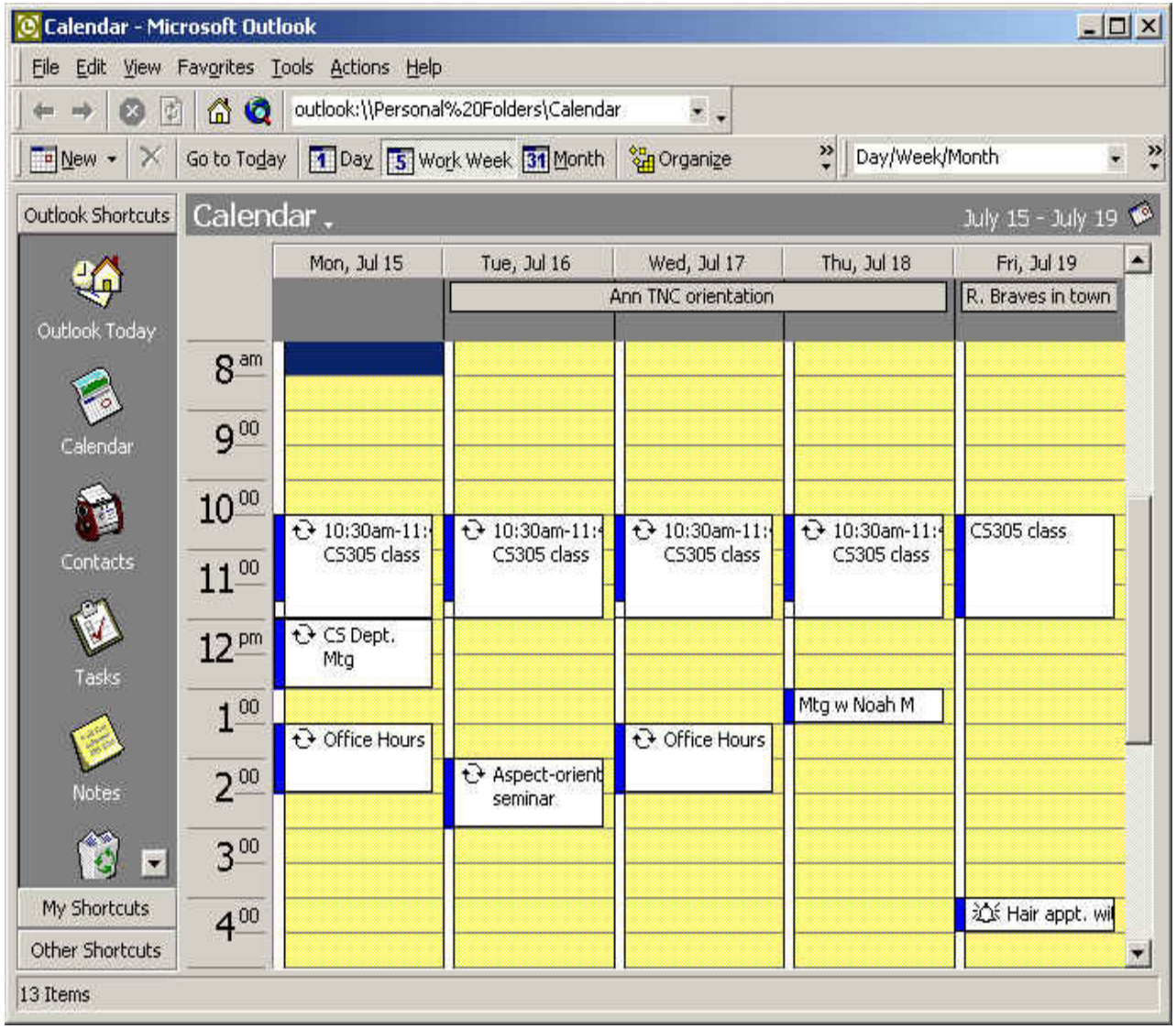
Multiple Rows of Tabs



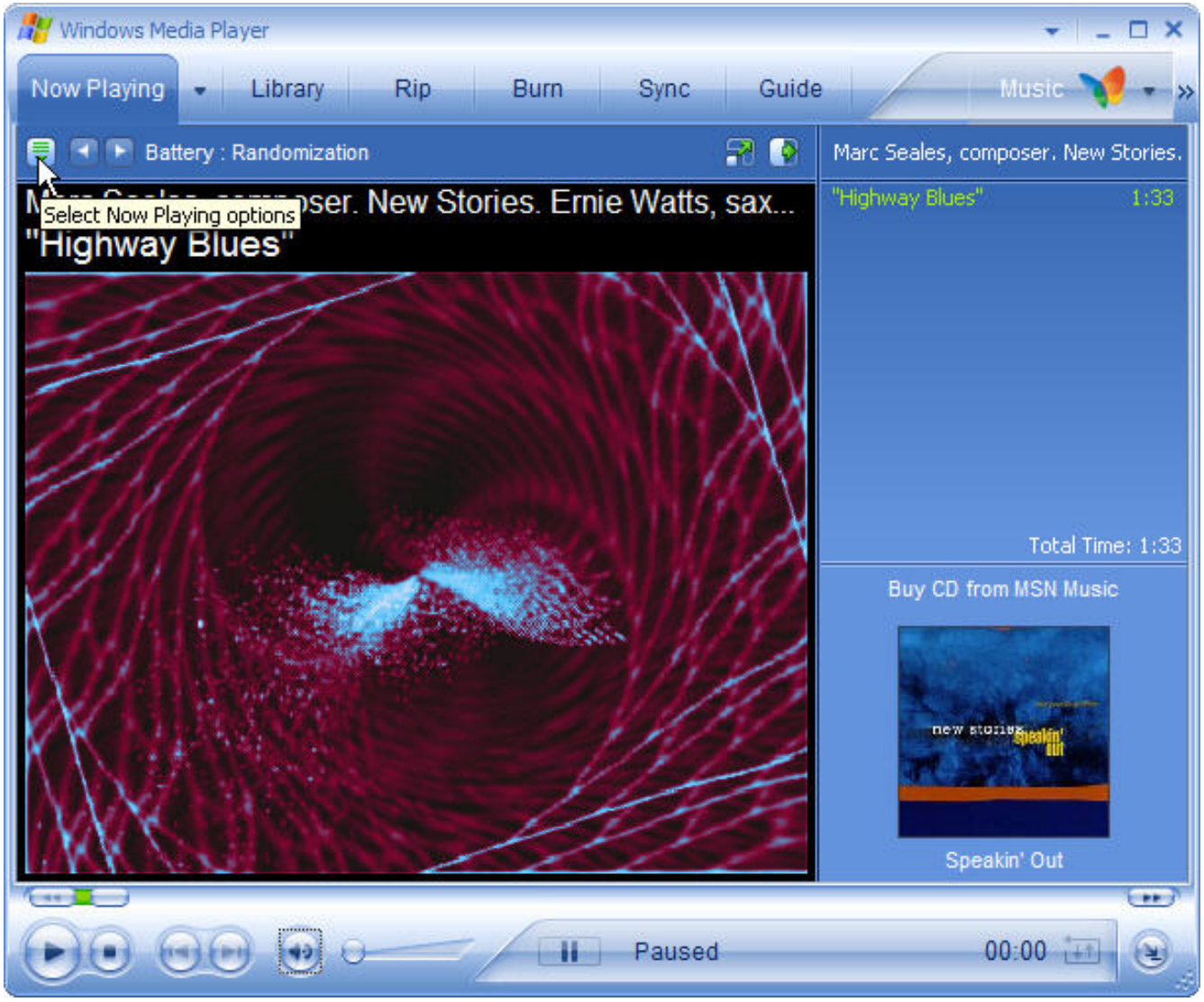
Visual C++ Settings



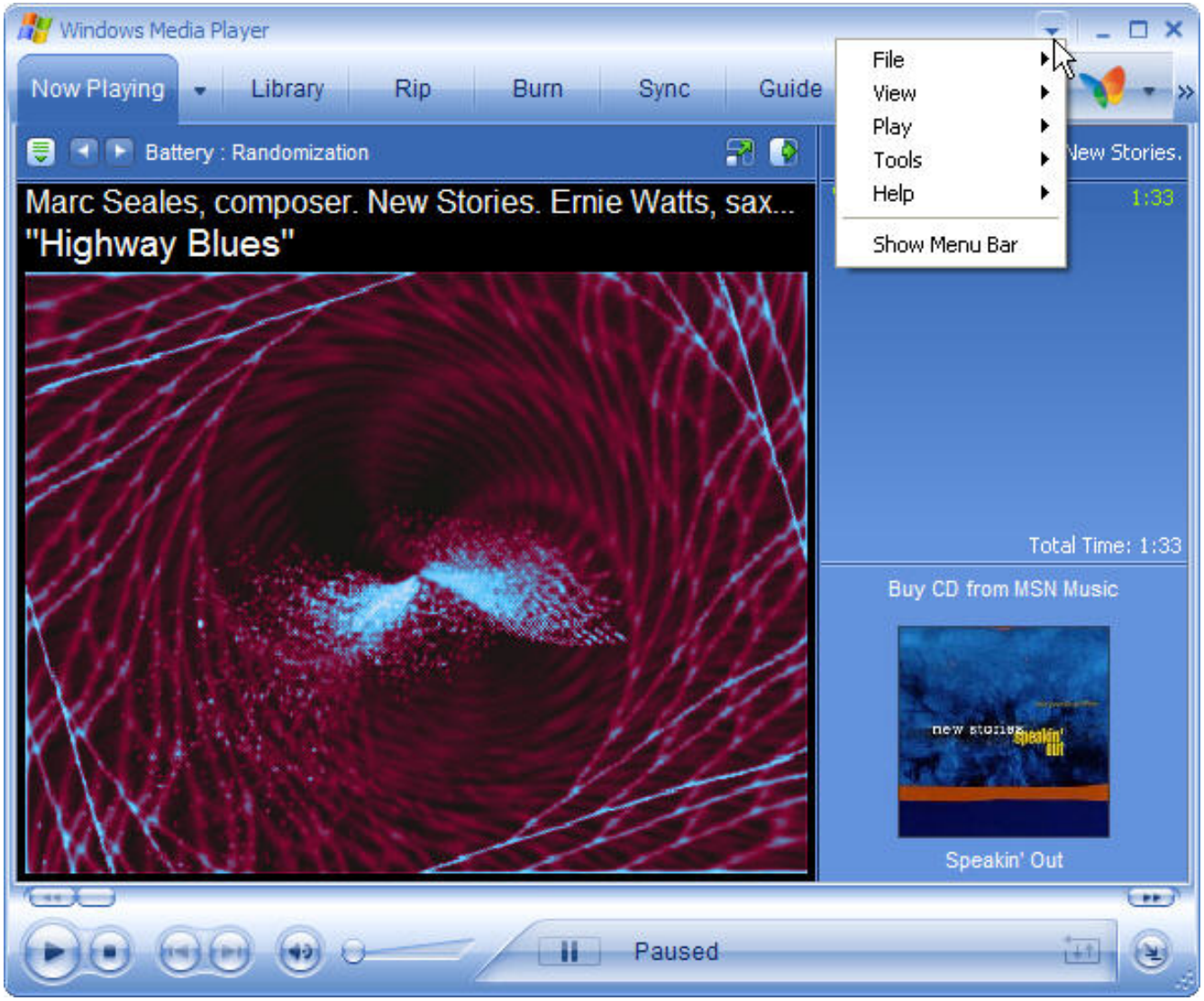
Outlook


Calendar - Microsoft Outlook
File Edit View Favorites Tools Actions Help
outlook:\\Personal%20Folders\Calendar
New
Go to Today
Day
Work Week
Month
Organize
Day/Week/Month
Outlook Shortcuts
Outlook Today
Calendar
Contacts
Tasks
Notes
My Shortcuts
Other Shortcuts
Calendar
July 15 - July 19
Mon, Jul 15
Tue, Jul 16
Wed, Jul 17
Thu, Jul 18
Fri, Jul 19
Ann TNC orientation
R. Braves in town
8 am
9 00
10 00
11 00
12 pm
1 00
2 00
3 00
4 00
10:30am-11: CS305 class
CS305 class
CS305 class
CS305 class
CS305 class
CS Dept. Mtg
Mtg w Noah M
Office Hours
Office Hours
Aspect-orient seminar
Hair appt. wil
13 Items

Windows Media Player



Windows Media Player



General guidelines for arranging windows

- Ensure window arrangement is only changed by the user
- Keep secondary windows to only one level and limit their number
  - Secondary windows can be:
    - Windows within windows
    - Separate windows that depend on a primary window
- Make the use of secondary windows optional
- As alternatives use multiple primary windows or menus

Window Focus

- Which window gets events like key-presses?
- Two approaches have been used:
  - “Mouse focus” vs. “click-to-focus”
- Mouse focus
  - Typical of original UNIX X-windows windows managers
  - Input goes wherever the mouse is pointing
    - Windows doesn’t have to be on top
  - Input can go into a partly obscured window
- Comments?

Mouse Focus: pros/cons

- Disadvantages
  - Harder for novices
  - Not-consistent with other platforms
- Advantages:
  - Allows easier interaction with multiple windows without rearranging
  - Faster interaction in many cases

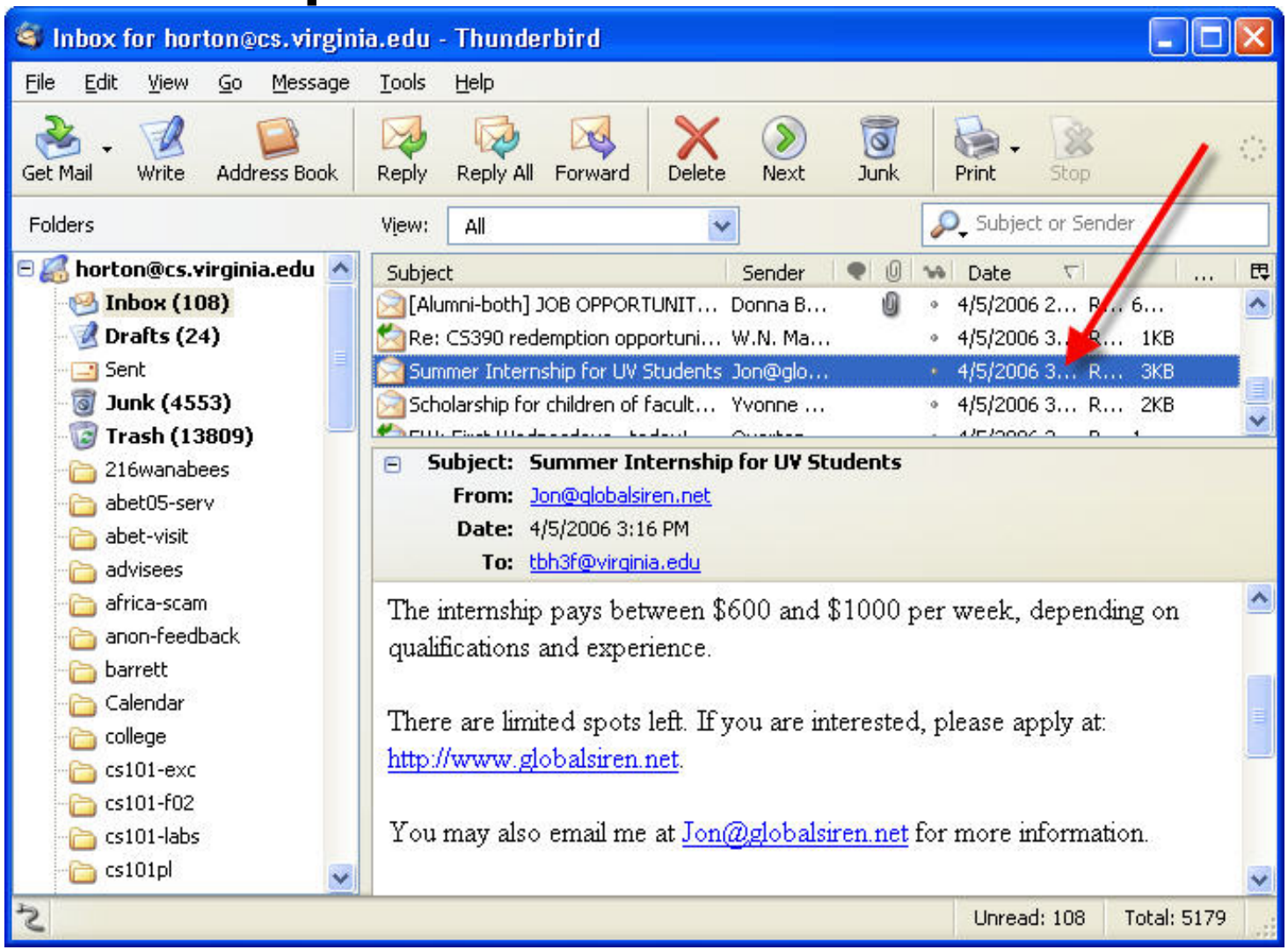
Click-to-Focus

- Click to focus
  - Default in MS-Windows and Macintosh
  - A window must be brought to the front before it will accept input
  - Input goes to that window regardless of where the mouse is pointing
  - Advantage:
    - Input cannot accidentally input to the wrong window

Focus within Applications

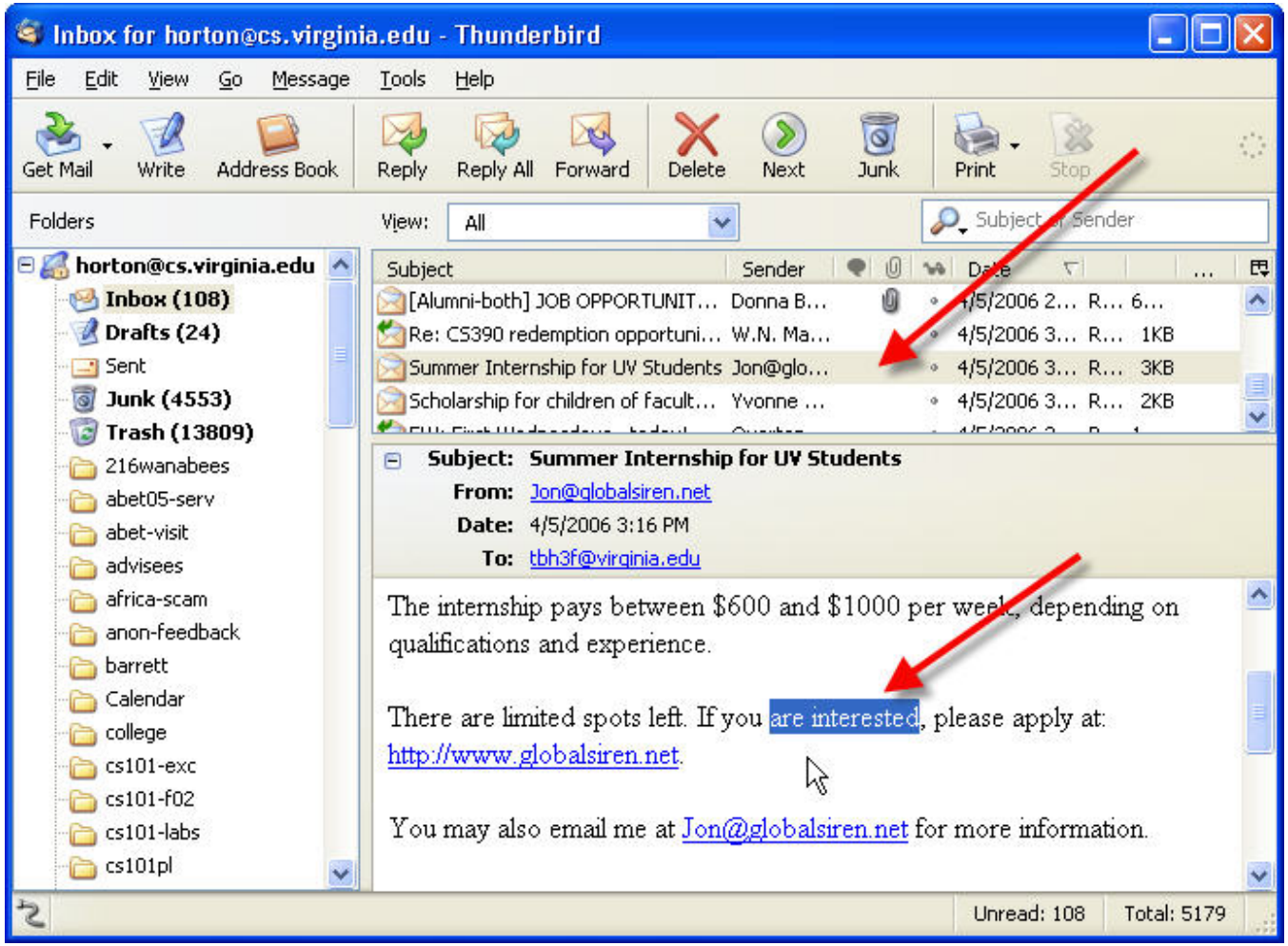
- Many apps have multiple panes or panels
- Case study: Thunderbird/Mozilla email client
  - message-list pane and message-pane
  - change of focus for key-input after one of the two scroll-bars has been used
  - Demo'd in class, but some screen captures next
- What are the issues is usability terms?
  - Your answers are:
  - Visibility: Can I easily see which pane has focus?
  - Consistency: Clicking message-list scroll-bar assigns key-focus to message list, but not the other way

Two panes, Two scroll-bars



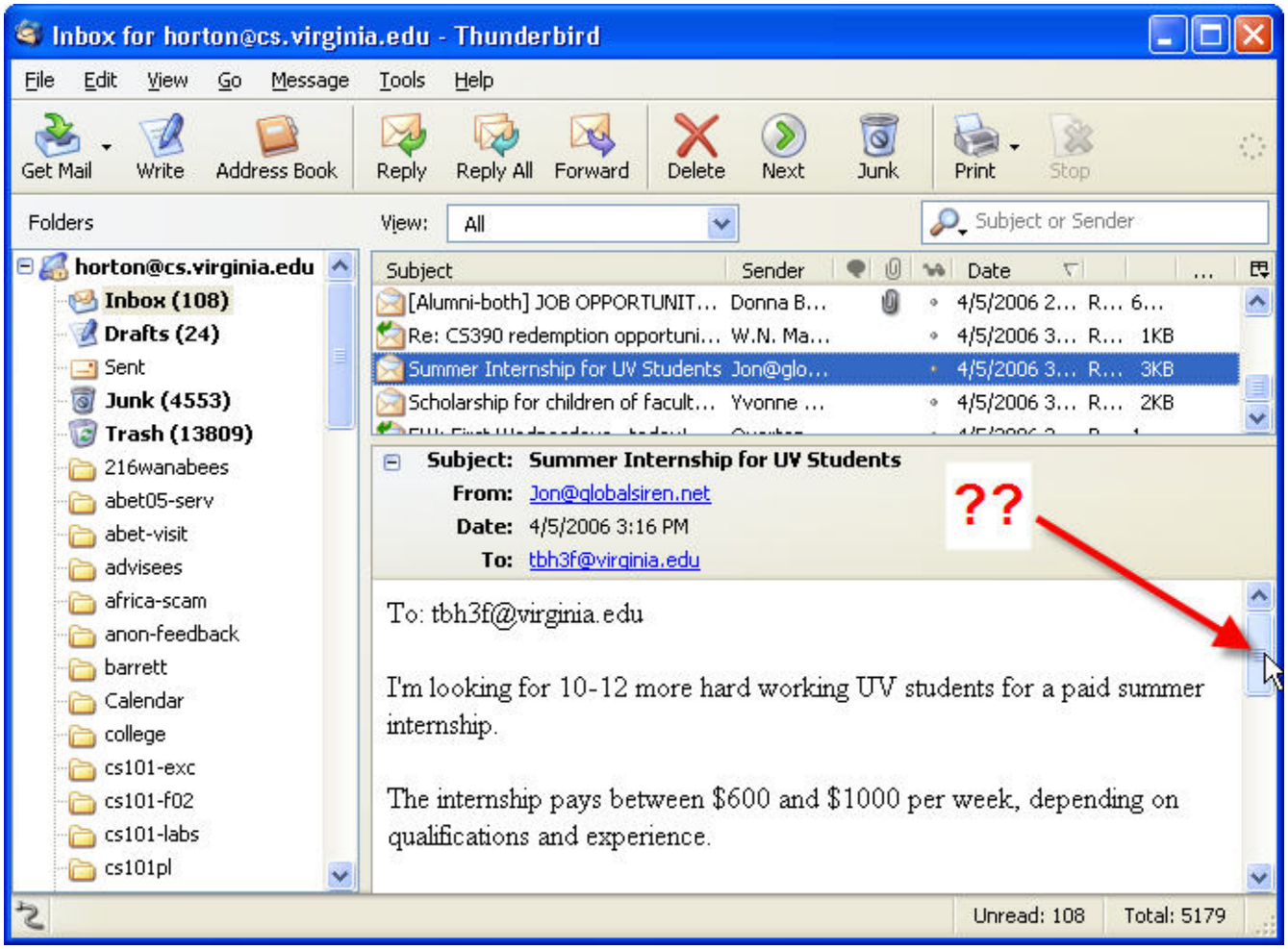
Select message first. What does PageUp change? The message-list.

Two panes, Two scroll-bars



Select text in message, then hit PageUp. What changes? The message.

Two panes, Two scroll-bars



Move message scroll-bar, then hit PageUp. What changes?
Surprise! The message-list!

Widgets within Windows

- Terminology:
  - widgets, controls (.NET), components (Java)
  - Here I mean: “smaller” GUI objects in a window that the user directly interacts with
    - Input, output, display, control,…
- menus, toolbars, buttons
- option buttons, check-boxes, list-boxes, text-boxes, combo-boxes
- Others too

Commands

- Menus and menu-structure
- Buttons
- Toolbars

Buttons

- Maybe the simplest widget?
- But
  - What labels? Too often defaults to OK, Continue, Accept, etc. when that is ambigious in the context
  - Where positioned? Consistency, prominent position
  - Size and shape: pretty vs. visible

Toolbars

- Alternatives to menu hierarchies
  - Why have them? Your answers are:

- Location: tool bar at top of window, or secondary window (floating)
- Key issue: the icons
  - Problems, issues?

Desirable Icon Properties

- Easily distinguished
- Easily recognized and understood
- Visually simple
- Easy to perceive
  - Use of color, detail, not to complex
- Informative
  - Good example: text-justification icons
- Should represent concrete objects
  - Home, printer

- *From Horton, 1991 (no relation)*

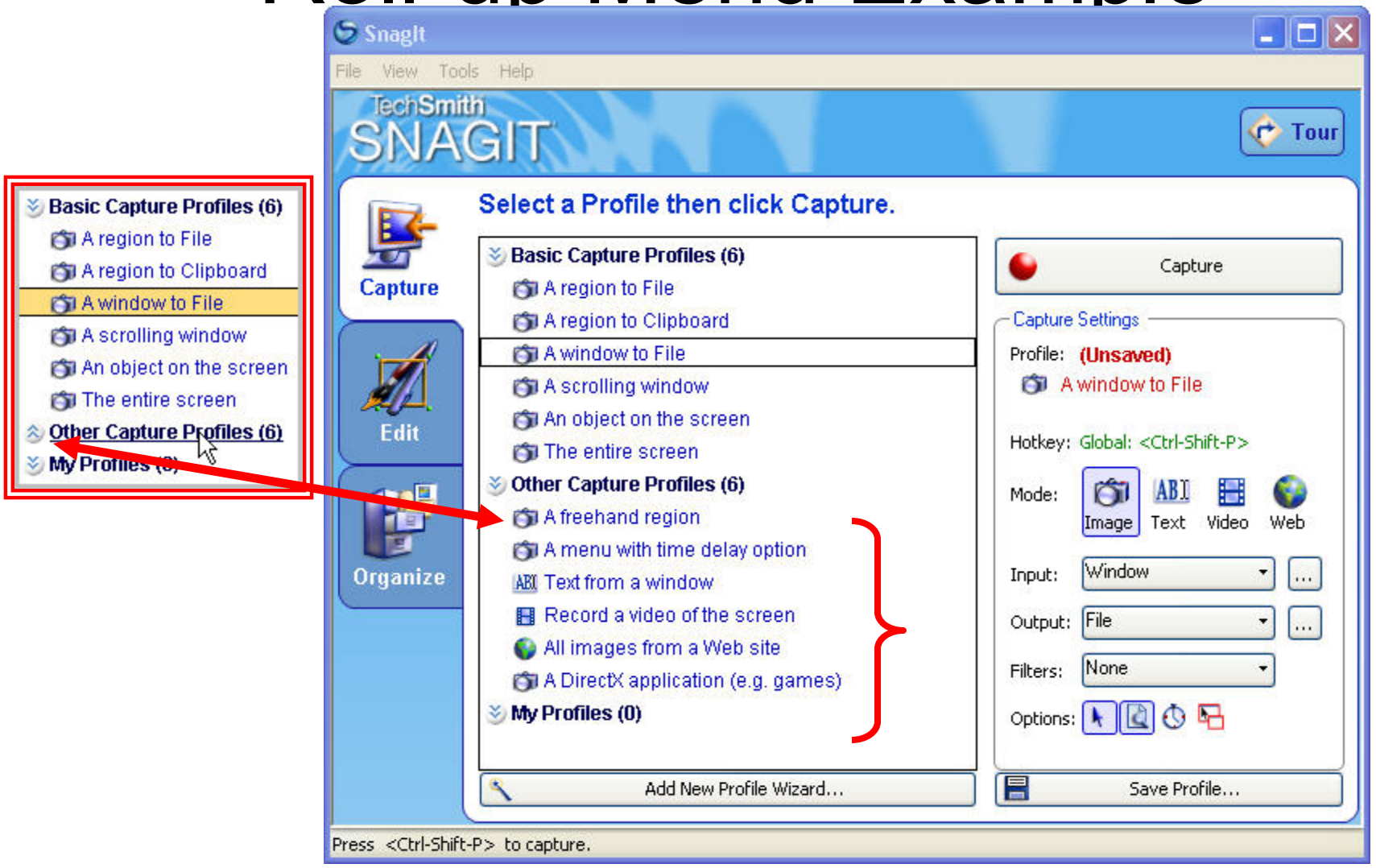
More on Icons

- See ID-book, Chaper 6 figure 6.9 and after.
- Note icon design for handheld devices
  - Digital cameras
  - Phones
- Let's discuss some examples!

Menus

- Types
  - Permanent (menu bar, in a form, toolbar)
  - Pull-down
  - Pop-up
  - Roll-up
  - Modal: Each menu is a complete screen or Web page
- Note: there are equivalents to menus on web-pages, hand-held devices
  - Many principles that follow apply to these too!

Roll-up Menu Example



Menus

- Meaningful organization demonstrated to reduce error rates, think time
  - Organize based on task-related objects and actions
  - Repetition of items in menus? (Creates a acyclic network.)
    - Confusing to some. See this on the Web.
    - Why?
      - Harder mental model with no “level”.

Menu Dimensions

- How to measure “size” or “complexity”?
- Menu items, nested menu items, nested menu items…
  - Many forms of this:
    Pull-down, screens, tabs, etc.
  - All are just different organizations of a multi-dimensional structure
- How to cope? Are there rules?

Menu Depth vs. Breadth

- Depth: number of levels
  Breadth: number of items per level
- Empirical studies show:
  Prefer menu breadth over depth.
  - Limit menu trees to three levels
  - User-stress has been tested in one study

Menu Content Organization

- **Item Presentation Sequence**
  - The order of items in the menu is important, and should take natural sequence into account when possible:
    - Time
    - Numeric ordering
    - Physical properties
  - When cases have no task-related orderings, the designer must choose from such possibilities as:
    - Alphabetic sequence of terms
    - Grouping of related items
    - Most frequently used items first
    - Most important items first.

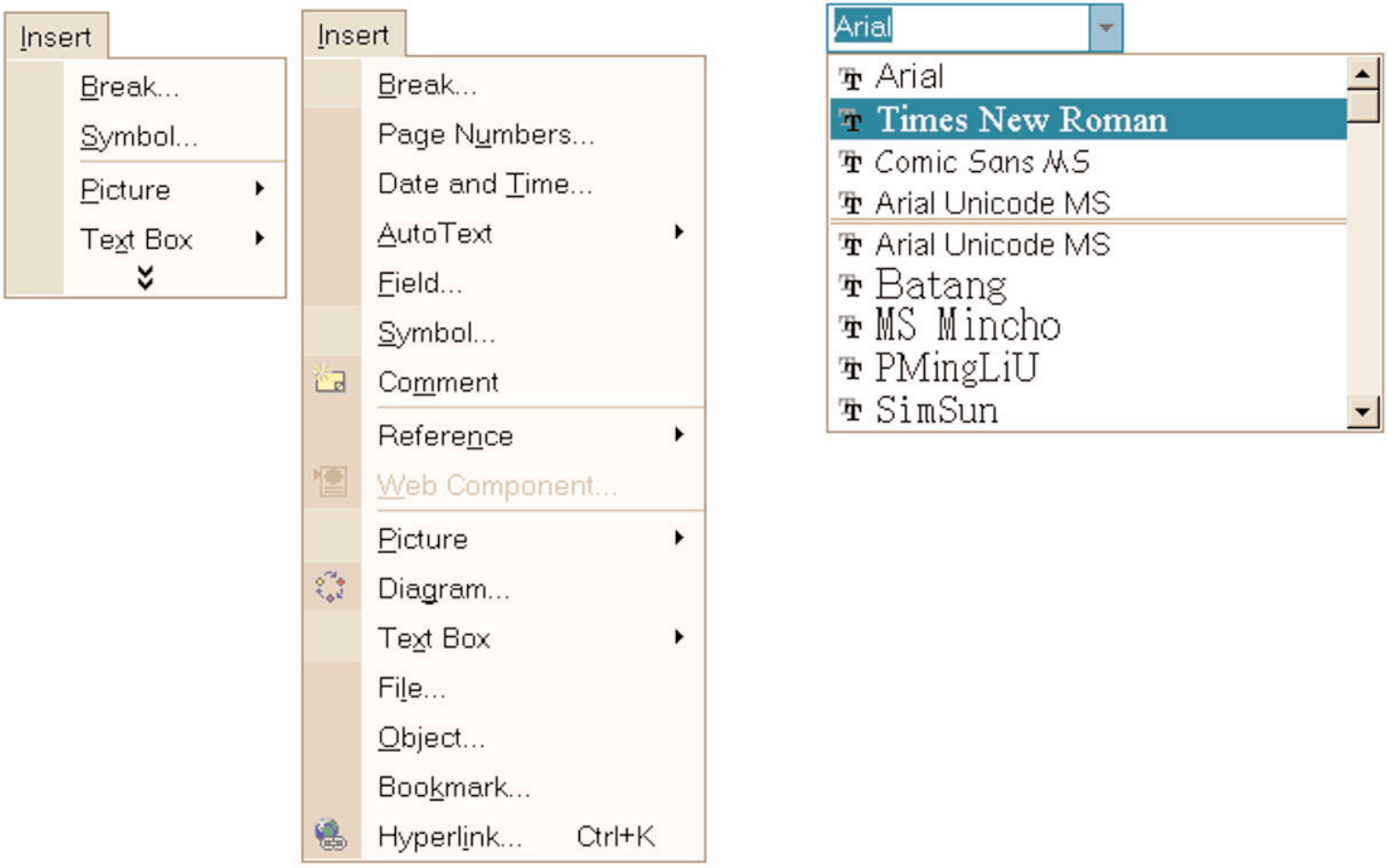
Menu Content Organization

- **Item Presentation Sequence**
  - The order of items in the menu is important, and should take natural sequence into account when possible:
    - Time
    - Numeric ordering
    - Physical properties
  - When cases have no task-related orderings, the designer must choose from such possibilities as:
    - Alphabetic sequence of terms
    - Grouping of related items
    - Most frequently used items first
    - Most important items first.

Menu Organization and Frequency of Use

- *Question: What do you think about Windows technique of hiding infrequently used items?*
  - These are known as *adaptive menus*
- What's the goal here?
  - Improve efficiency
- At what cost?
  - Consistency
- Users vary in their preference!
  - Possible to allow users to customize menu order
  - Or, mix frequency with standard order (e.g. fonts)

Content Organization and Freq.



Menu guidelines to assist users

- Keep menus self-explanatory
  - Give items meaningful labels
  - Be consistent in grammar and pattern in sets of menu labels
    - e.g. the following set of labels is bad!
    - ‘up’, ‘go down’, ‘forward’, ‘reverse’
  - Ensure all items correspond to the name of the menu
    - i.e. menu items should be meaningfully organized
    - e.g. on an ‘insert’ menu, all items should be things to insert

Menu guidelines to assist users

- When standards or conventions exist, follow them
    - e.g. ‘file’, ‘edit’ and ‘window’ menus
- Ensure items only correspond to the name of this menu (not any other)
  - i.e. make sure the each item can only logically be in one place
  - rename the item or the menus if necessary
  - Prevent users from searching the wrong menu

Menu guidelines to assist users

- Use checkmarks to show state of toggles
- Use a triangle to show when there is a submenu
- Use an ellipsis to show when the action cannot be completed without further input
  - e.g. ‘save as...’
  - Means a modal dialog box must be filled in
  - But don’t use an ellipsis when just opening a new non-modal window
- Group related menu items
  - Separate groups by horizontal lines
  - This allows users to focus attention
  - An ISO rule: $g = \sqrt{n}$ (Fig. 6.3, p. 235 in ID-Book)
  - Good grouping can allow the total number of items to be increased to 15-20

Menu guidelines to assist users

- Disable items that are not valid in the current context
  - ‘Grey them out’
  - Do not remove them unless the user persistently works in a context where a set of items is never valid (e.g. beginner mode)
  - Provide tool tip help even on disabled items

Menu guidelines to assist users

- Provide a facility to back up to the previous level in multi-level modal menus
  - E.g. to go to the home page or parent page
- Provide visible feedback so users know where they are in a menu hierarchy
  - e.g. when displaying a lower-level web page
    - Allow the user to pick from higher levels directly
  - For screens displayed as a result of menu choices, display the menu item that led to the screen
  - The above always ensures the user keeps a mental model of where they are
- Provide a **menu map**, equivalent of a site map on a Web site

Menu guidelines to assist users

- Use modal menus only for systems that are used for searching through categories of information
  - E.g. directories on the web
  - Design most applications so users have access to all commands at all times
- Consider providing ‘beginner’ menus with fewer choices

Menu guidelines to assist users

- Provide a way of accessing help on each menu and item
  - This facilitates exploring and building the user's mental model
  - Dynamic tool-tip/balloon help when cursor pauses over the item
  - One-key access to context-sensitive help about whatever the cursor is pointing to

Menu guidelines to assist users

- Allow direct picking of items from menus
  - ... as opposed to ‘choose the number’ of the menu item
  - On a character-based display, use cursor keys to select.
  - This only works if the number of items is few
  - Where there are too many items to allow cursor movement, preferably use mnemonic alphabetic choices
  - as well as cursor movement

Menu guidelines to assist users

- Help the user perform frequent and repetitive actions
  - Place the most used menu items near the top
    - If frequencies are equal, order by natural sequence or sequence performed in the task
    - If still equal, order alphabetically
    - But never sacrifice good grouping
  - Provide keyboard shortcuts and display them on the menu
    - Allow tailoring of shortcuts

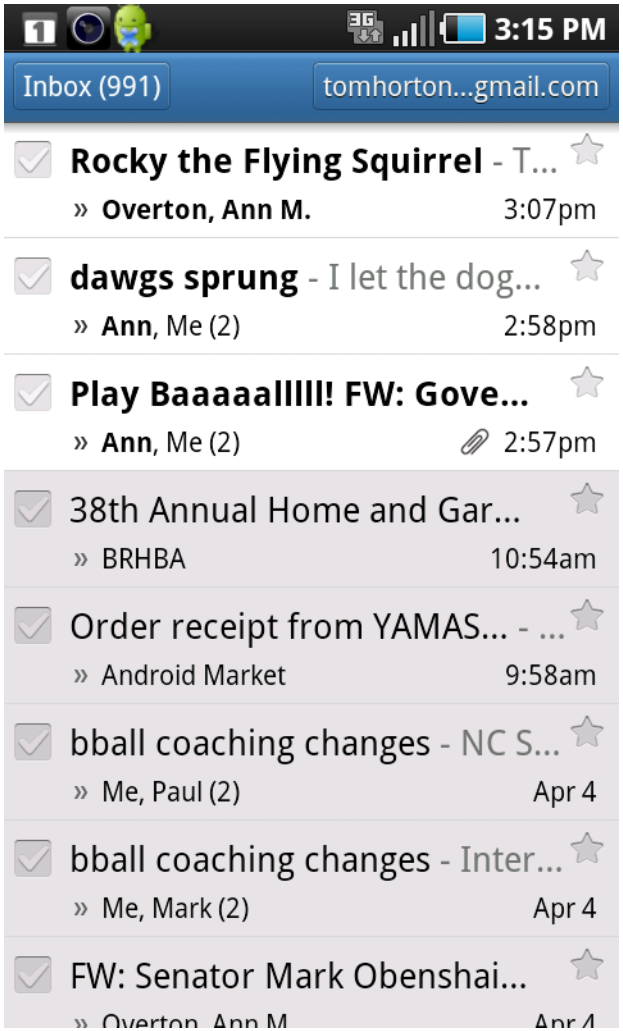
Menu guidelines to assist users

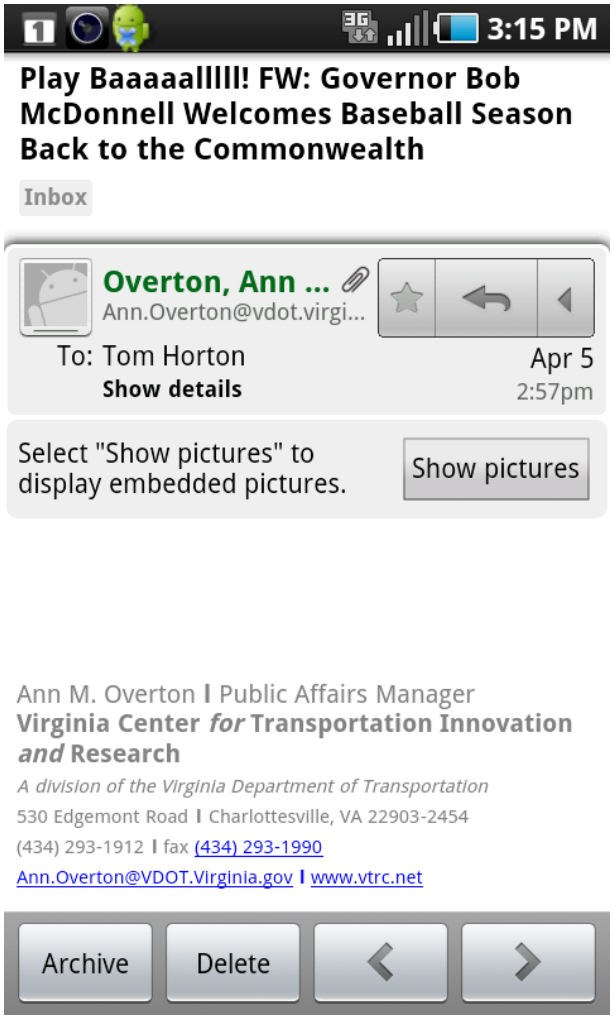
- Provide pop-up menus for key actions
  - Especially if context sensitive
  - i.e. action depends on what is selected
  - But in general, permanent menus are better
- Consider providing history tracking:
  - When a menu is displayed, place the cursor on the most recent item chosen from this menu
  - Palm OS does this

Summary of What We Covered

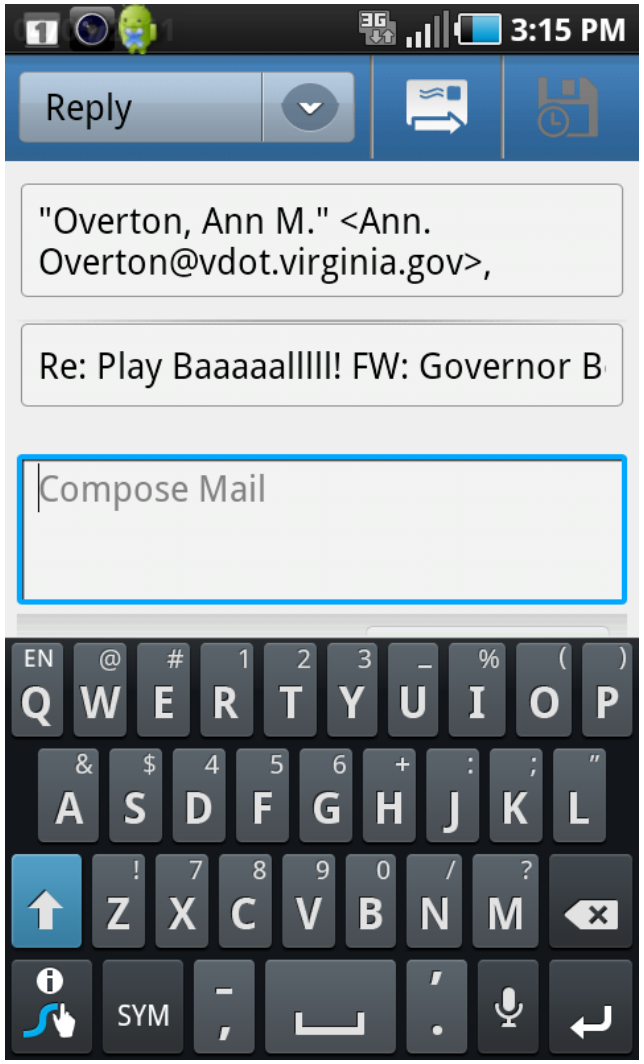
- Planning Overall Flow, Design
  - Patterns
  - Interaction Styles
- What goes into screens, menus?
- Types of Windows
- Commands
  - Buttons, Toolbars (icons)
  - Menus

Android (2.2) Gmail App

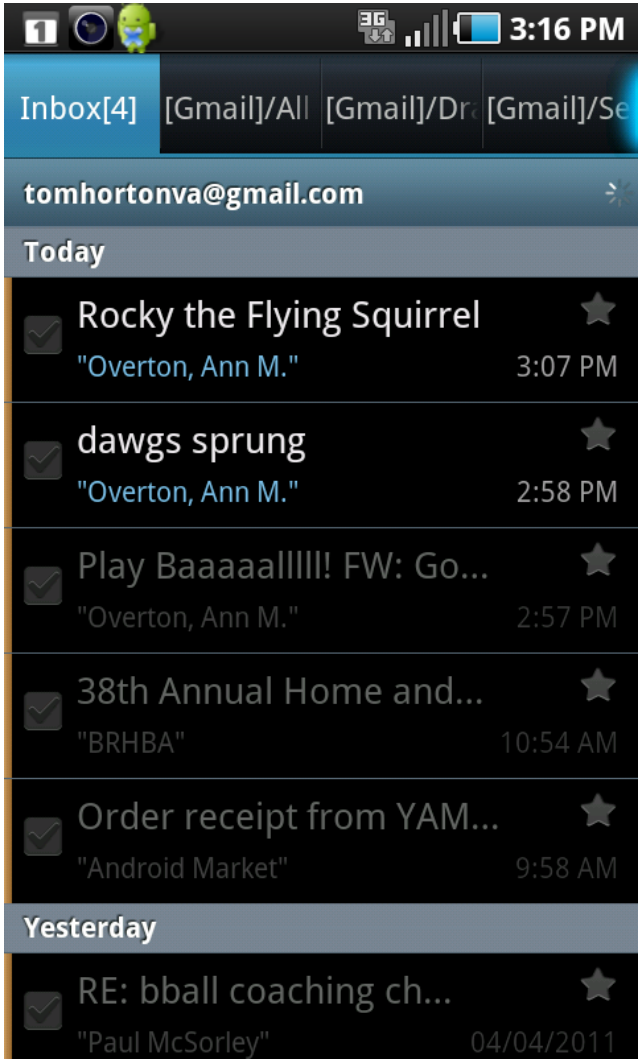


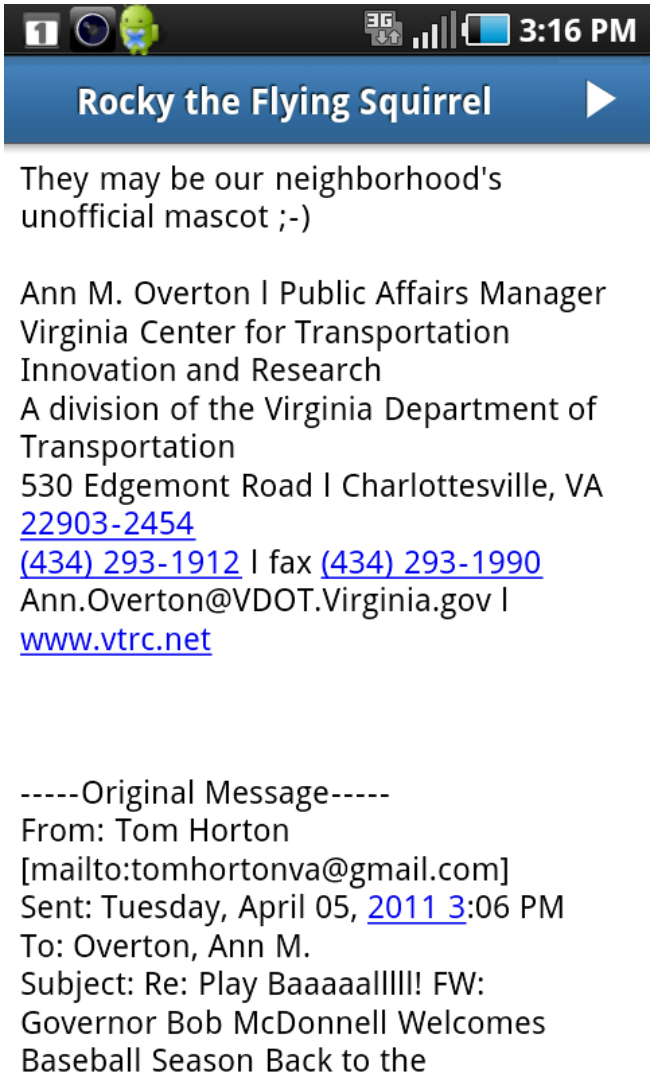


Android (2.2) Gmail App

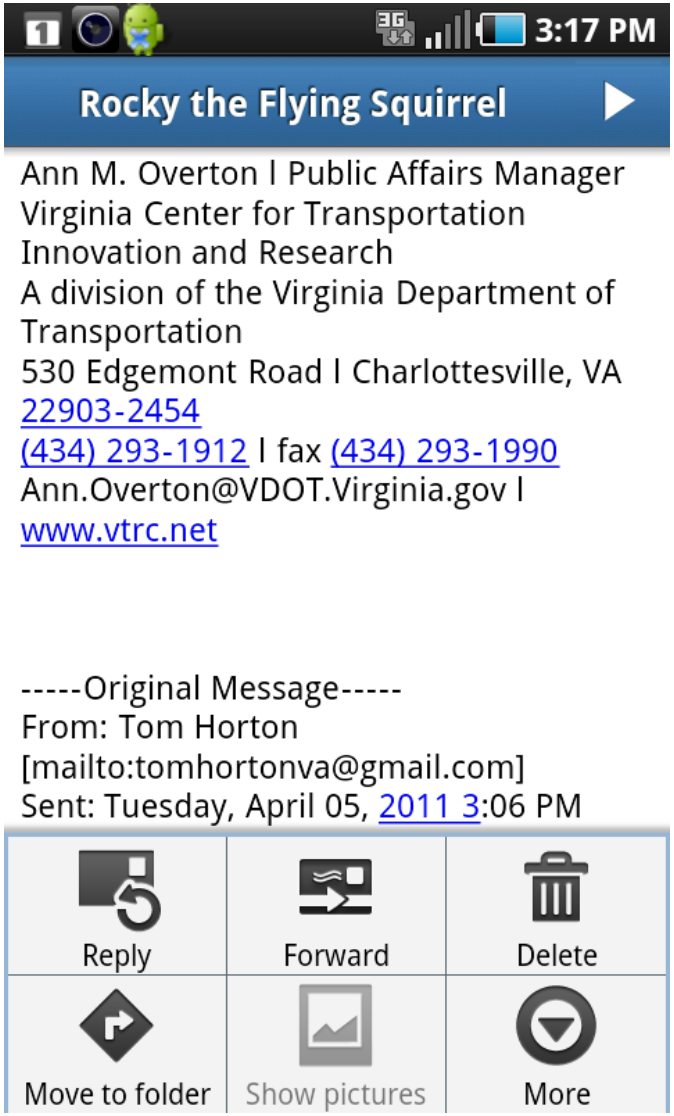


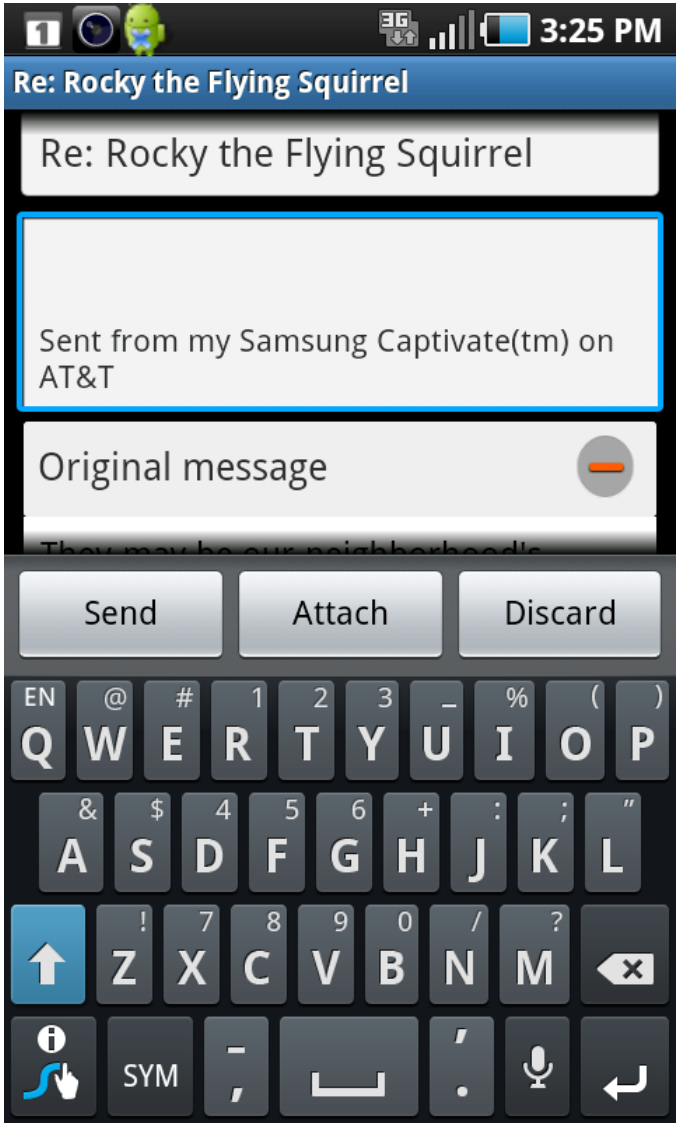
Android, Samsung Touch Email App



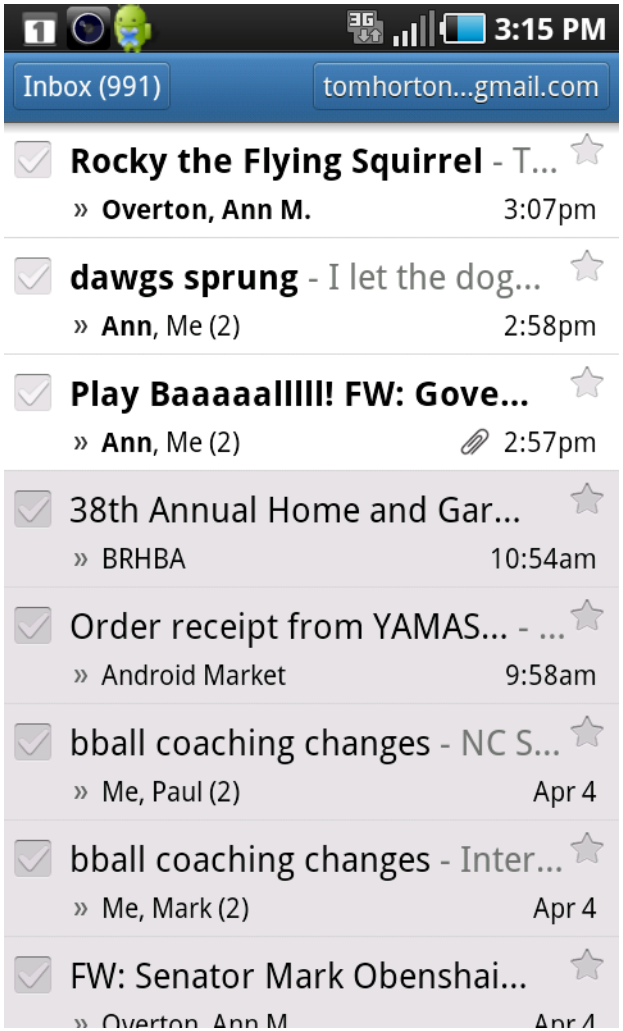


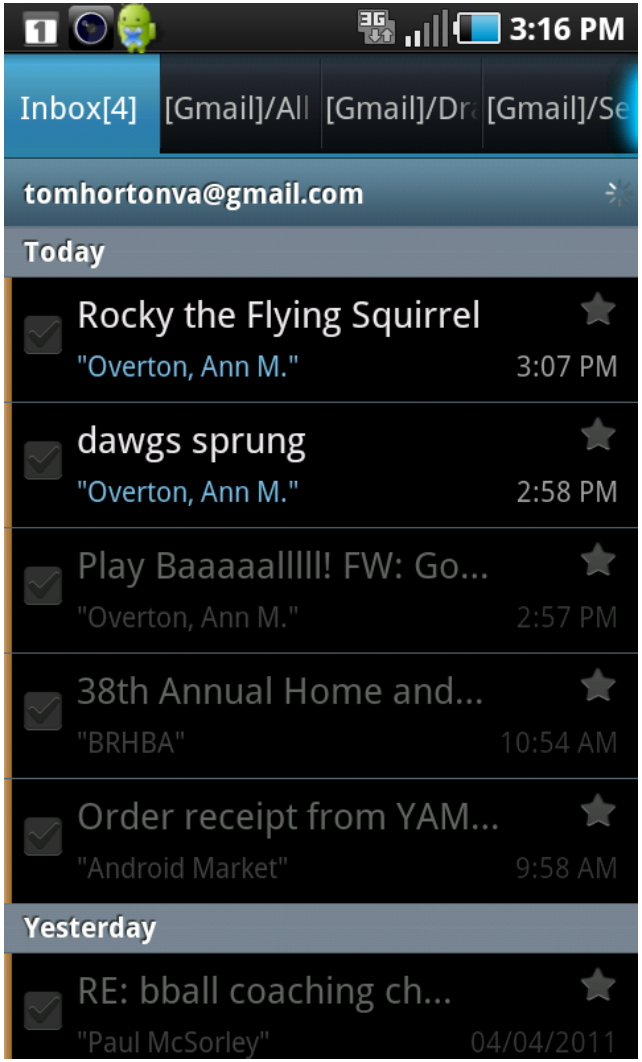
Android, Samsung Touch Email App



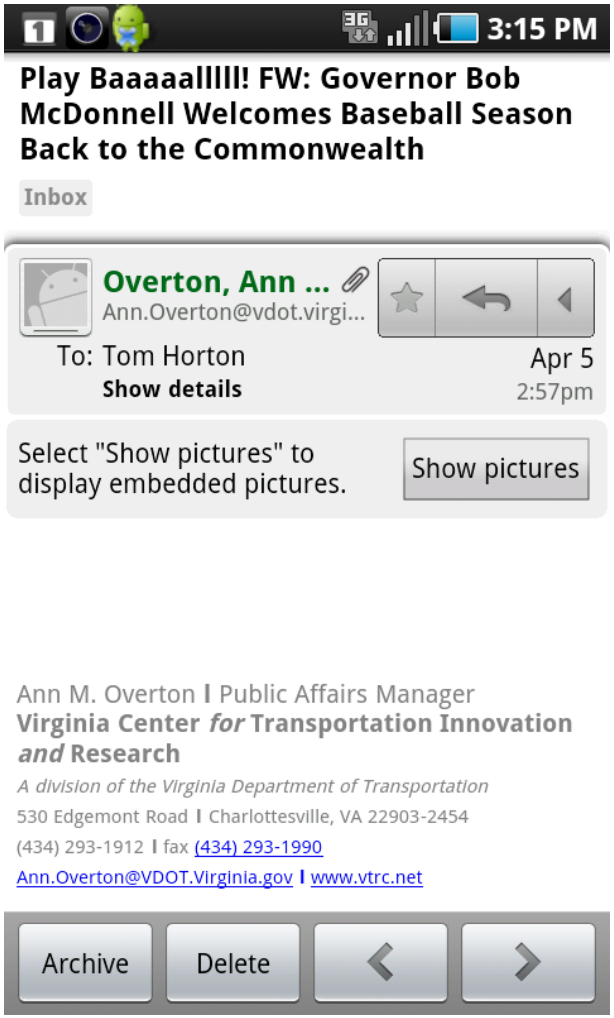


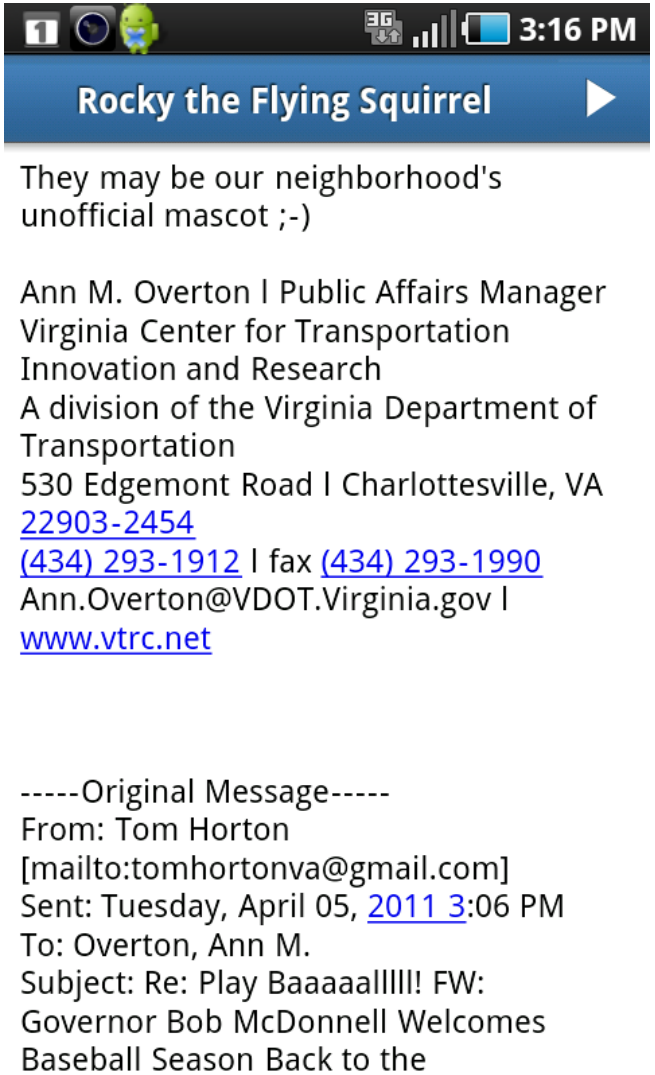
Top Screen: Message List



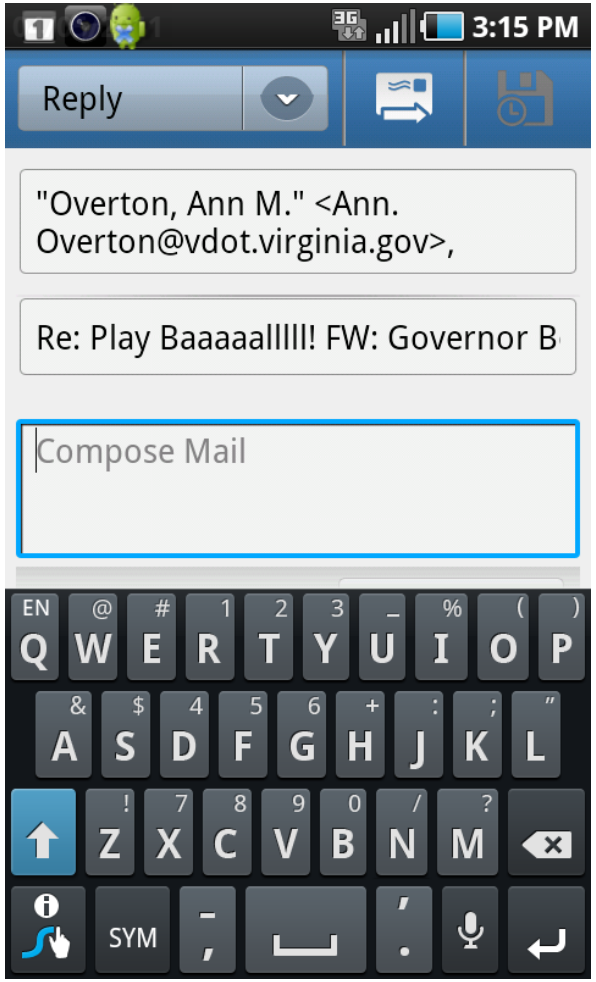


Display Message Screen

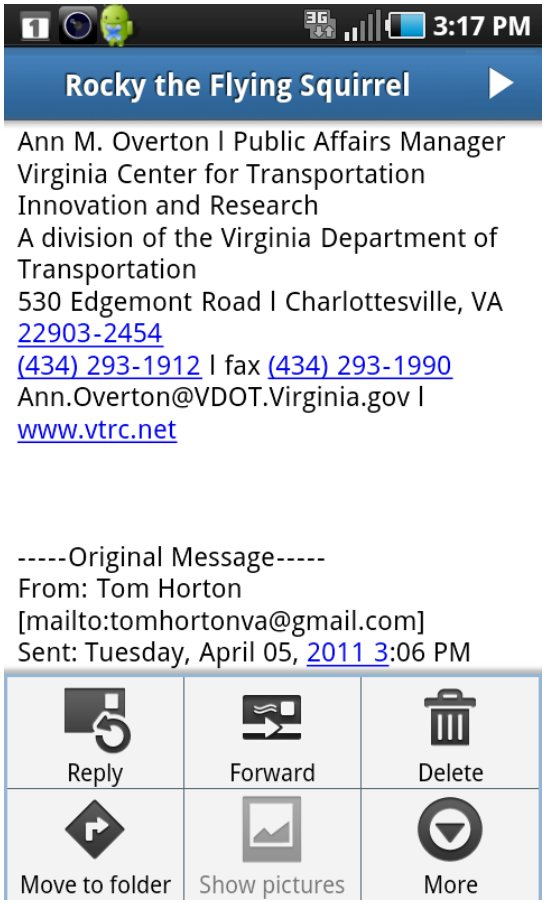


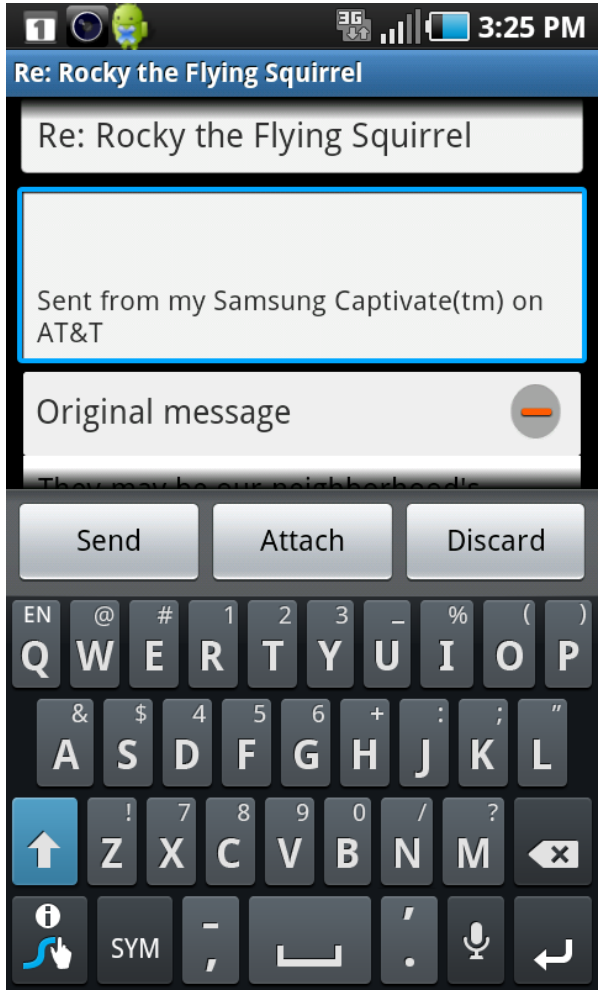


Compose Reply (one on left vs. two on right)



Hit Settings button to get this



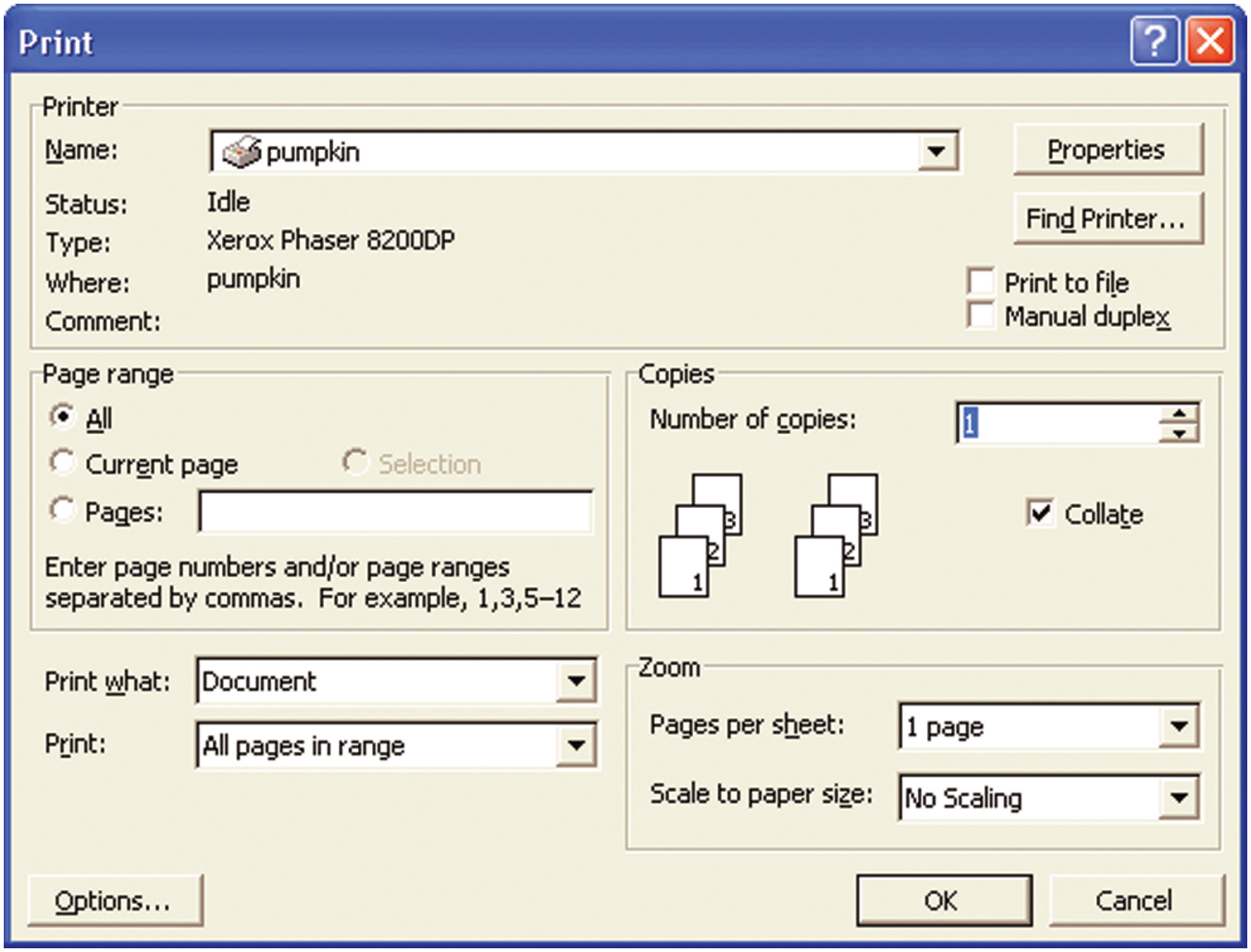


In-Class Exercise

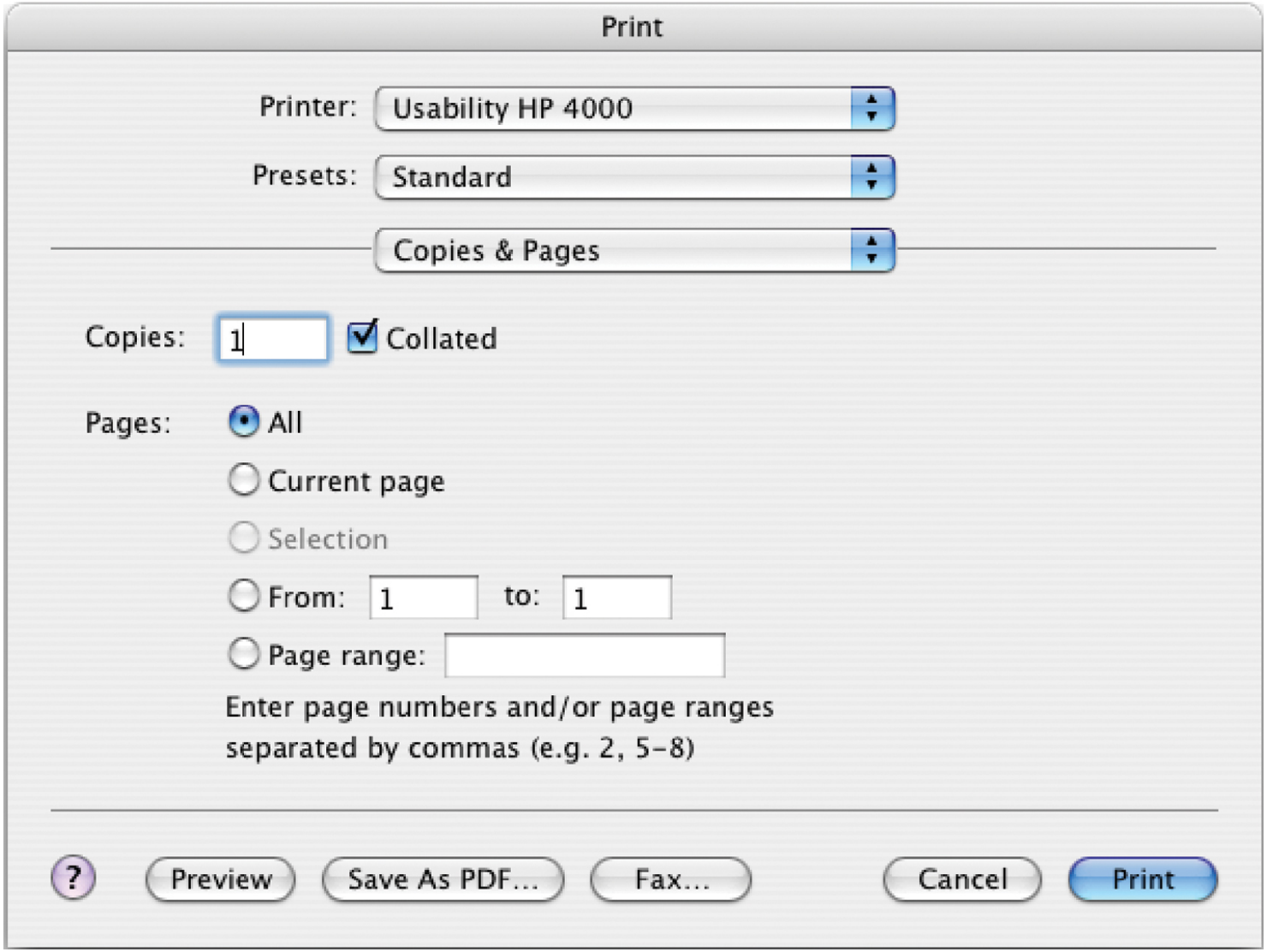
(Turn in with your names)

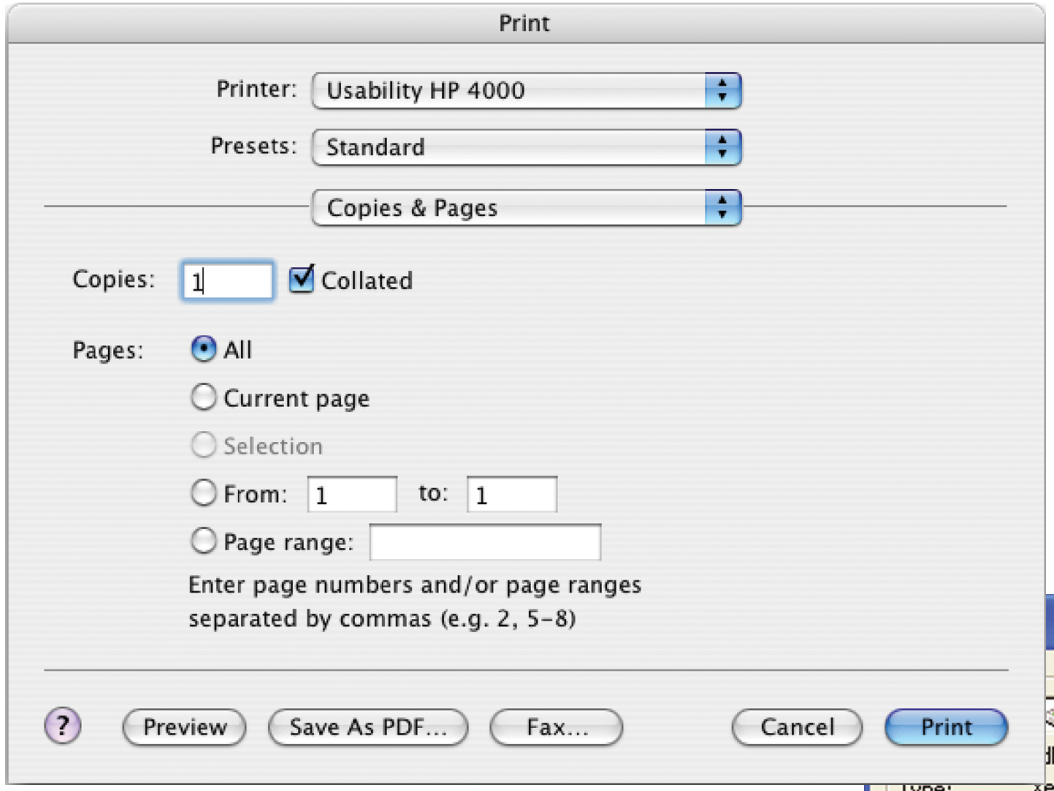
- Compare the two windows shown here.
- (1) Discuss differences in buttons in terms of:
  - Affordance of buttons
  - Use of color
  - Shape of buttons
  - Positioning of buttons
  - Wording of text in buttons
- (2) Compare window organization in terms of tasks supported on the two windows
- (3) Discuss in usability terms differences in physical layout

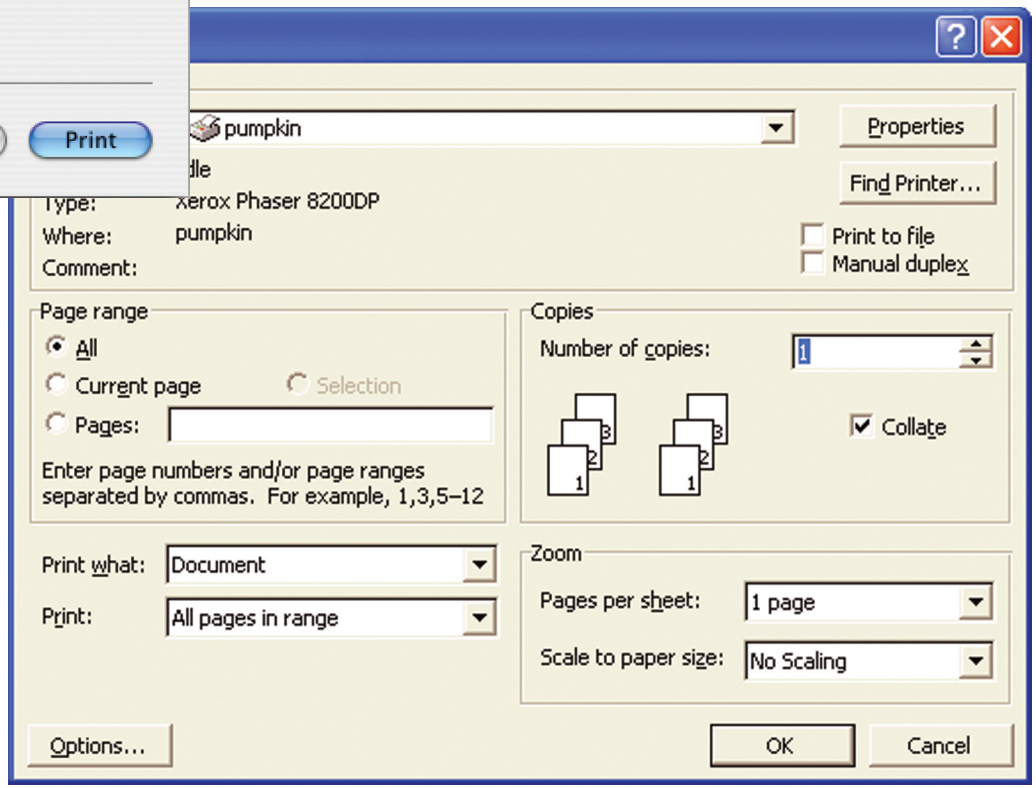
From In-class Exercise, Windows

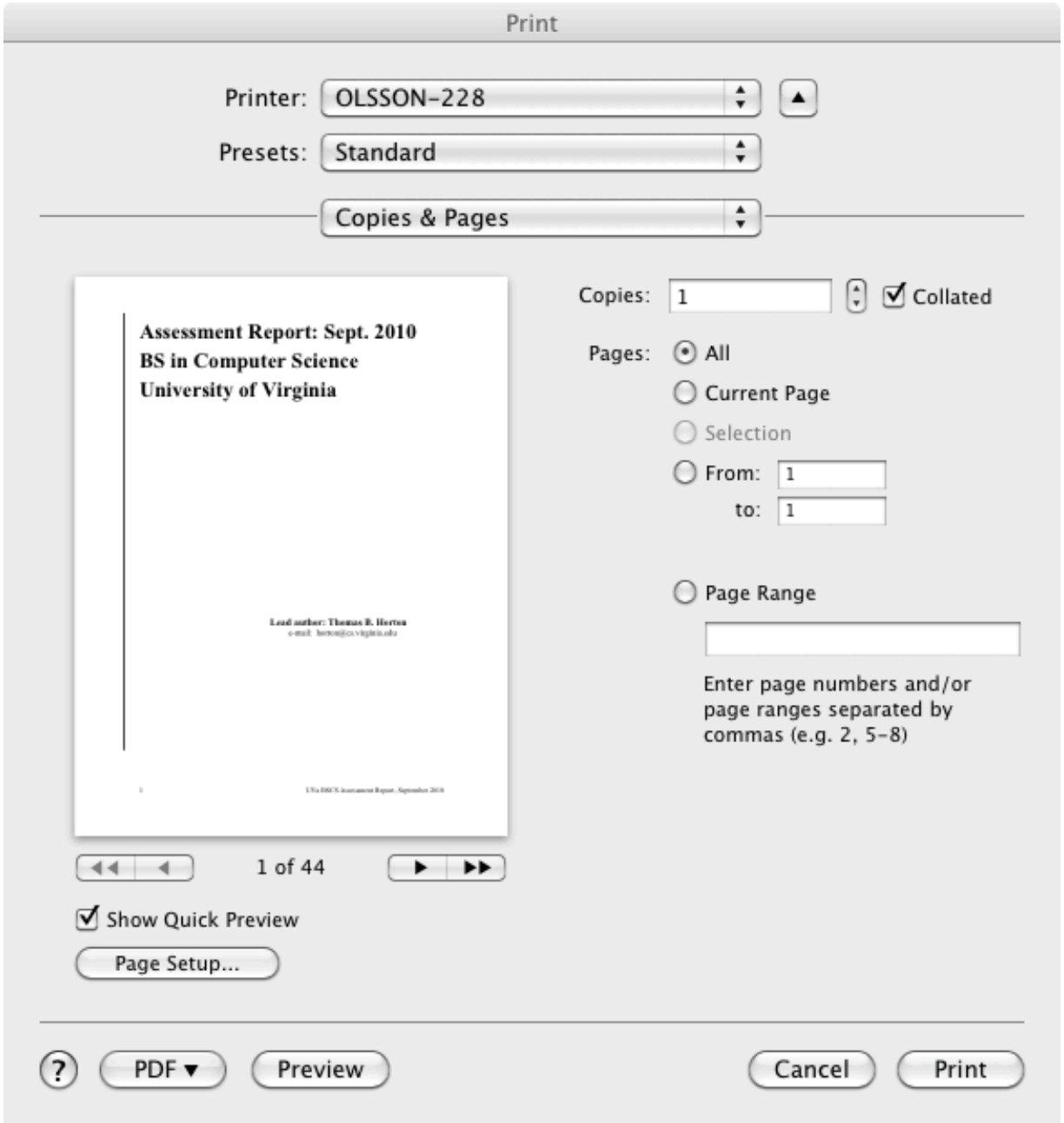


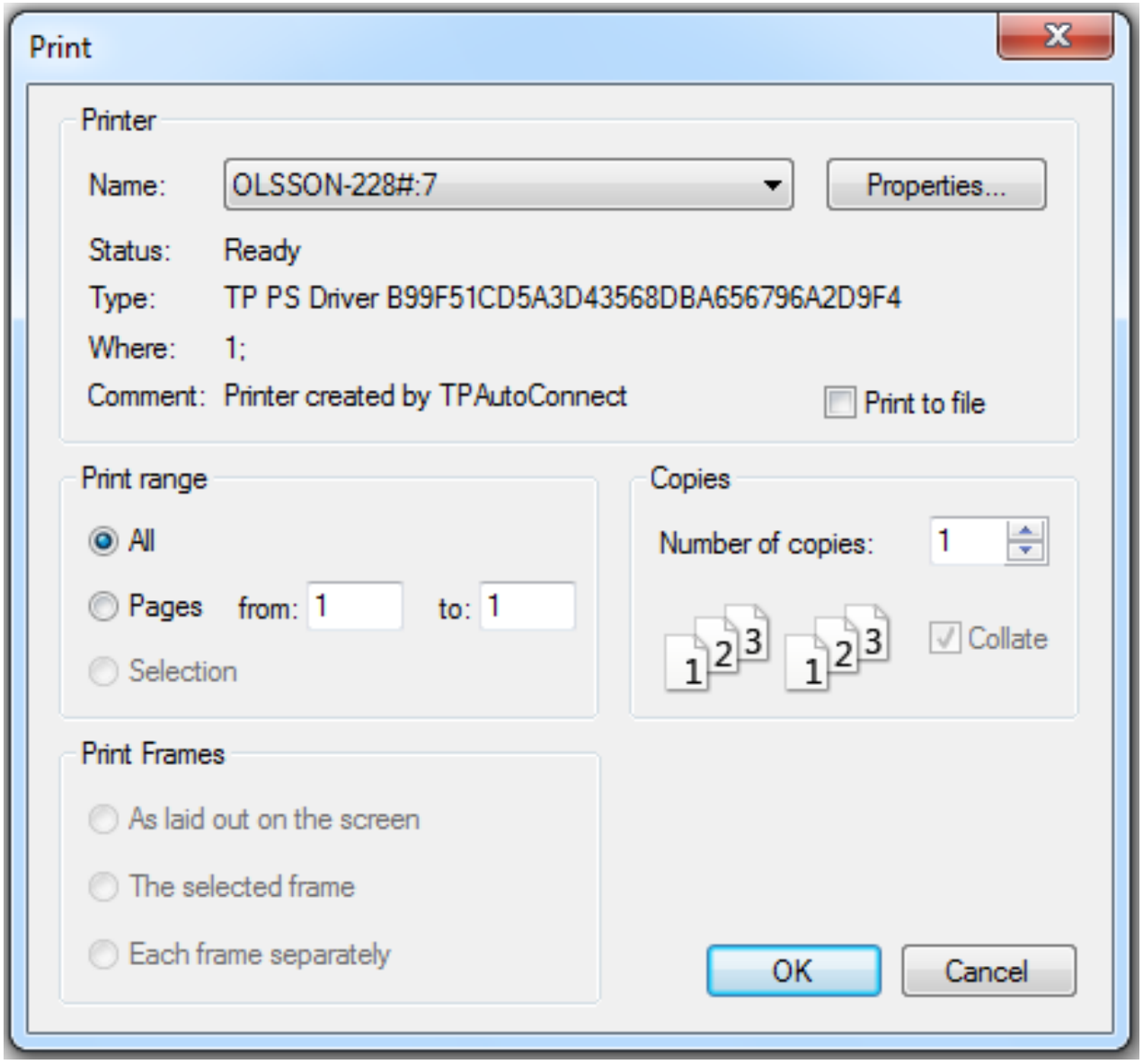
From In-class Exercise, Mac OS

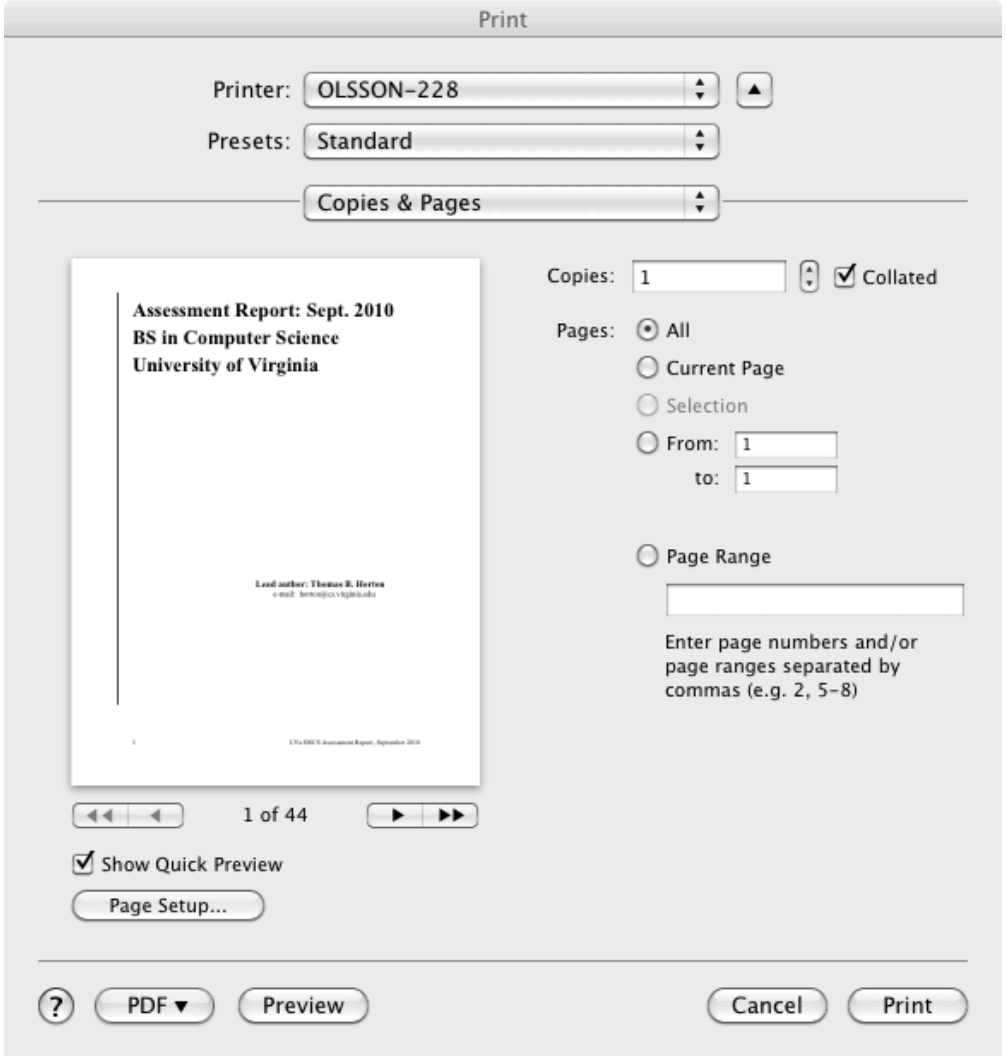


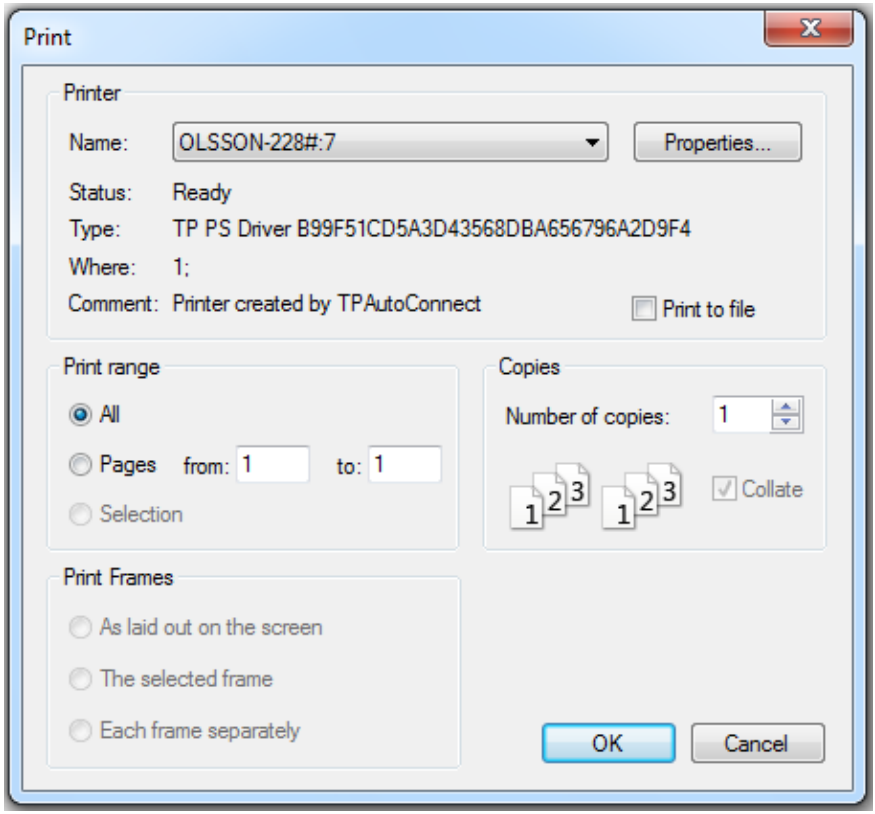

Print
Printer: Usability HP 4000
Presets: Standard
Copies & Pages
Copies: 1 Collated
Pages: All
Current page
Selection
From: 1 to: 1
Page range:
Enter page numbers and/or page ranges
separated by commas (e.g. 2, 5-8)
Preview
Save As PDF...
Fax...
Cancel
Print

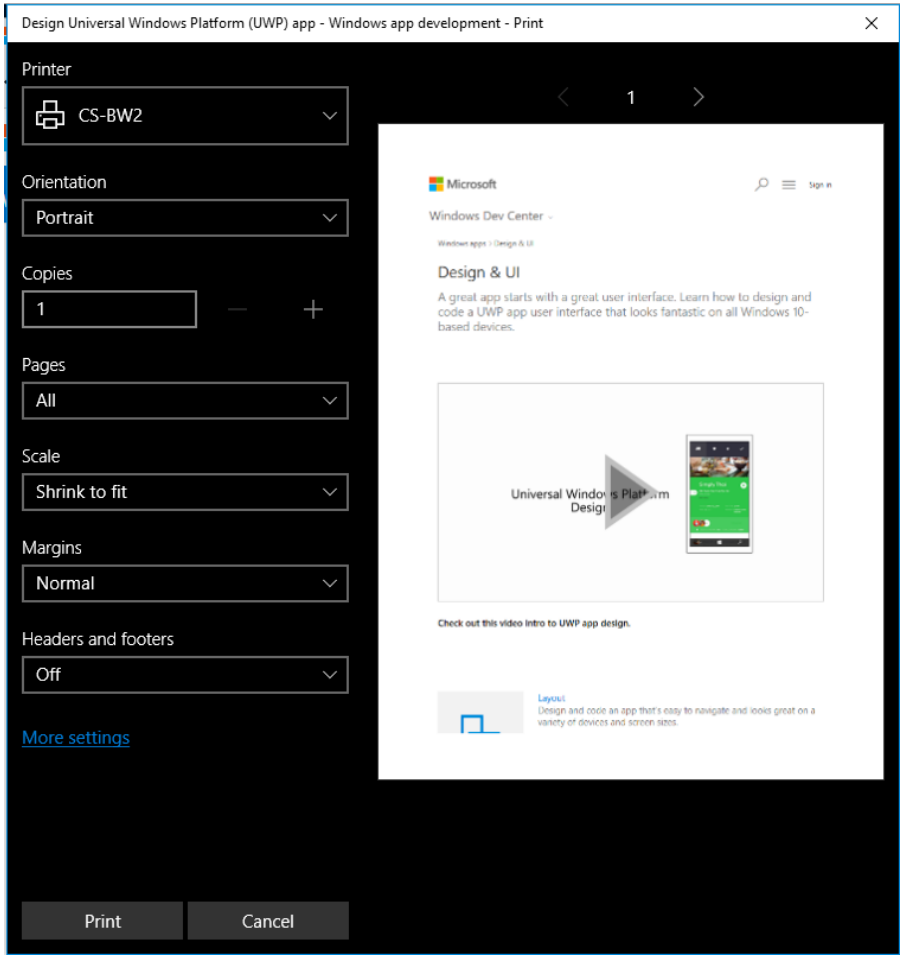

pumpkin
Properties
Find Printer...
Type: Xerox Phaser 8200DP
Where: pumpkin
Comment:
Print to file
Manual duplex
Page range
All
Current page
Selection
Pages:
Enter page numbers and/or page ranges
separated by commas. For example, 1,3,5-12
Copies
Number of copies: 1
Collate
Print what: Document
Print: All pages in range
Zoom
Pages per sheet: 1 page
Scale to paper size: No Scaling
Options...
OK
Cancel

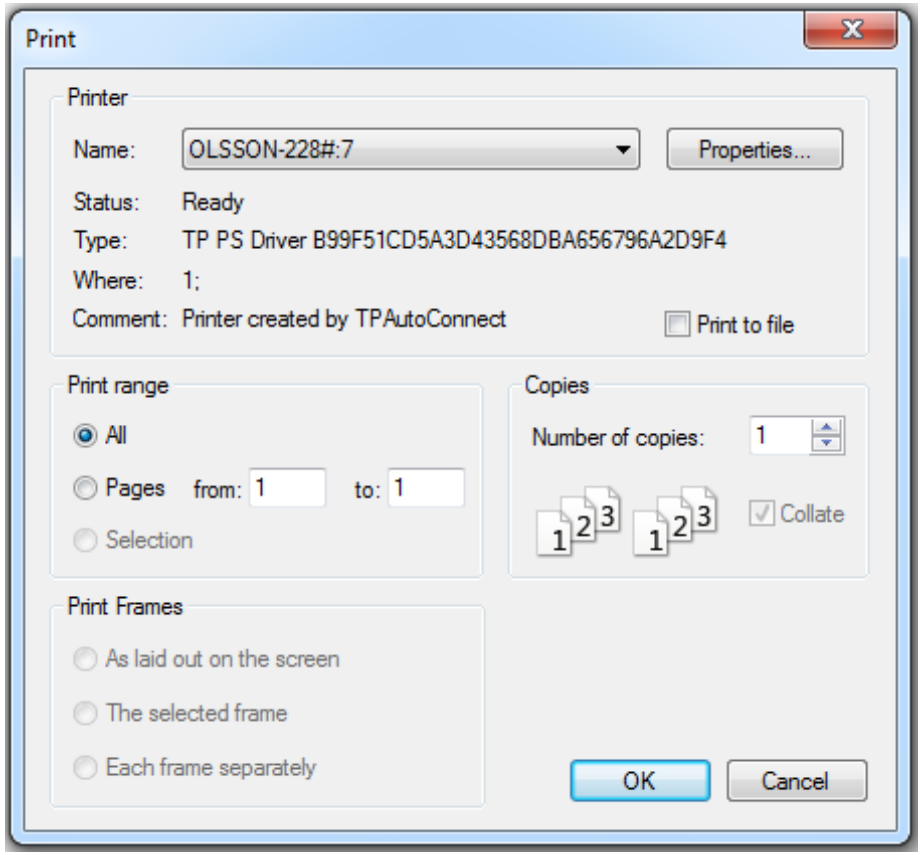

Print
Printer: OLSSON-228
Presets: Standard
Copies & Pages
Assessment Report: Sept. 2010
BS in Computer Science
University of Virginia
Lead author: Thomas B. Horton
1 of 44
Show Quick Preview
Page Setup...
Copies: 1
Collated
Pages: All
Current Page
Selection
From: 1
to: 1
Page Range
Enter page numbers and/or page ranges separated by commas (e.g. 2, 5-8)
PDF ▾
Preview
Cancel
Print

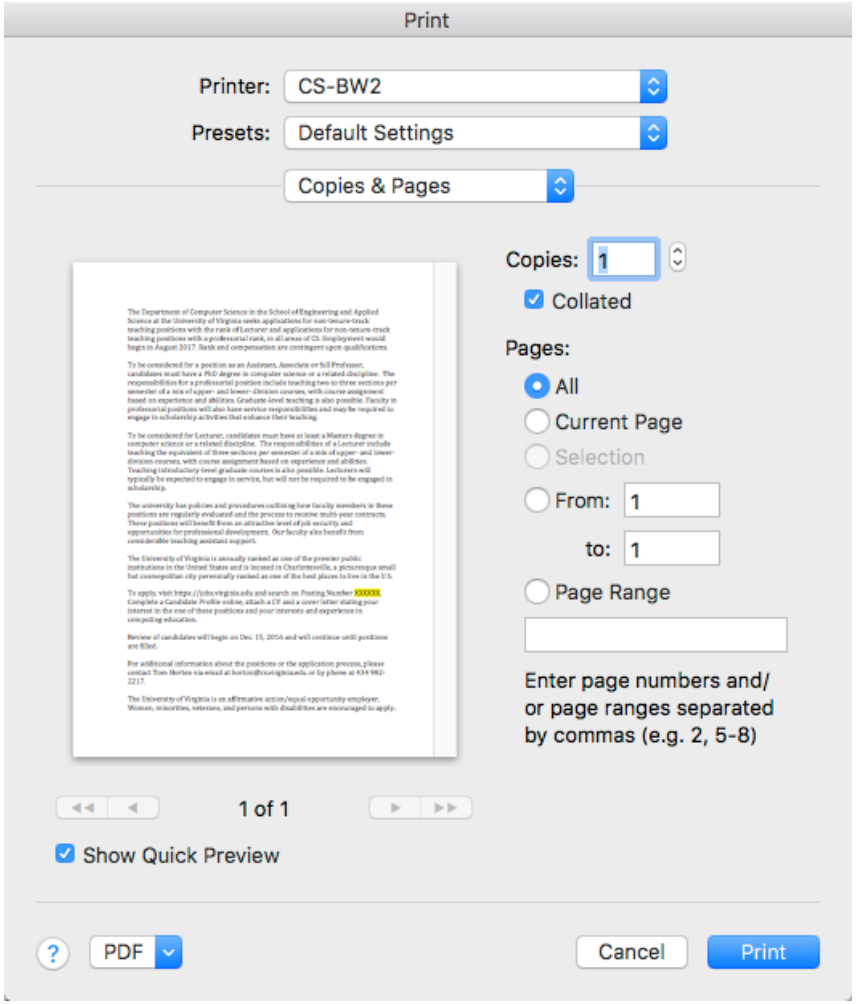

Print
Printer
Name:
OLSSON-228#:7
Properties...
Status:
Ready
Type:
TP PS Driver B99F51CD5A3D43568DBA656796A2D9F4
Where:
1;
Comment:
Printer created by TPAutoConnect
Print to file
Print range
All
Pages
from:
1
to:
1
Selection
Copies
Number of copies:
1
1 2 3
1 2 3
Collate
Print Frames
As laid out on the screen
The selected frame
Each frame separately
OK
Cancel

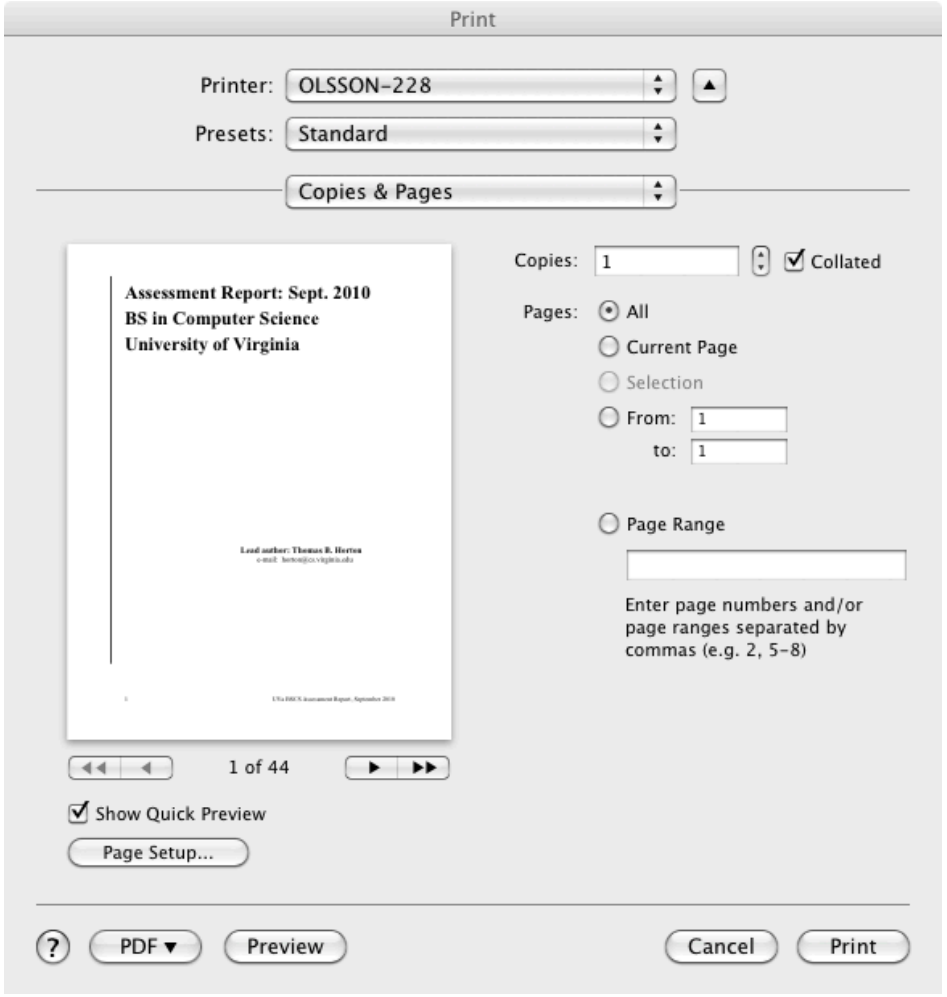

Print
Printer: OLSSON-228
Presets: Standard
Copies & Pages
Assessment Report: Sept. 2010
BS in Computer Science
University of Virginia
Copies: 1
Collated
Pages: All
Current Page
Selection
From: 1
to: 1
Page Range
Enter page numbers and/or page ranges separated by commas (e.g. 2, 5-8)
1 of 44
Show Quick Preview
Page Setup...
PDF
Preview
Cancel
Print

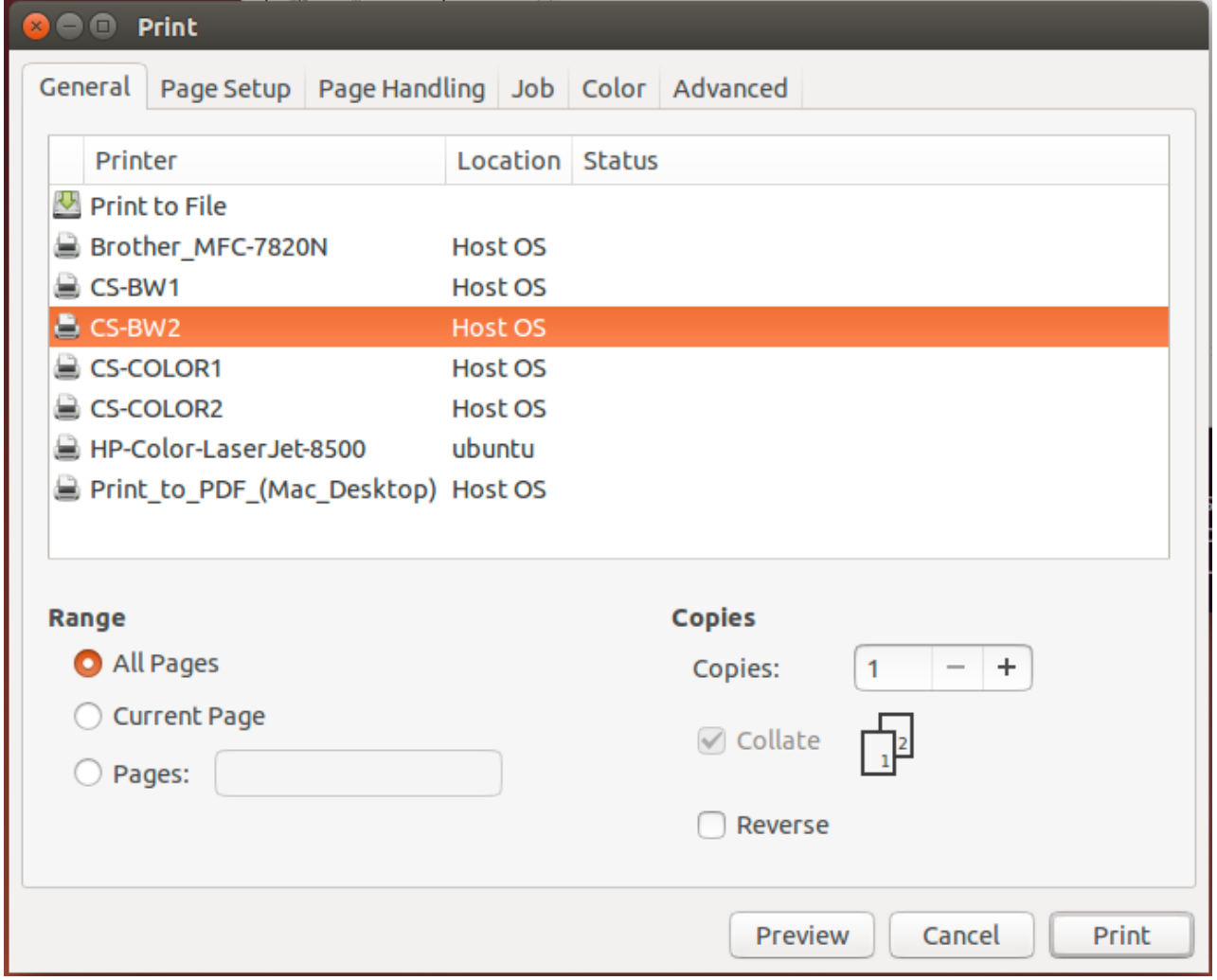

Print
Printer
Name: OLSSON-228#:7
Properties...
Status: Ready
Type: TP PS Driver B99F51CD5A3D43568DBA656796A2D9F4
Where: 1;
Comment: Printer created by TPAutoConnect
Print to file
Print range
All
Pages from: 1 to: 1
Selection
Copies
Number of copies: 1
Collate
Print Frames
As laid out on the screen
The selected frame
Each frame separately
OK
Cancel


Design Universal Windows Platform (UWP) app - Windows app development - Print
Printer
CS-BW2
Orientation
Portrait
Copies
1
Pages
All
Scale
Shrink to fit
Margins
Normal
Headers and footers
Off
More settings
Print
Cancel
1
Microsoft
Windows Dev Center
Design & UI
A great app starts with a great user interface. Learn how to design and code a UWP app user interface that looks fantastic on all Windows 10-based devices.
Check out this video intro to UWP app design.


Print
Printer
Name:
OLSSON-228#:7
Properties...
Status:
Ready
Type:
TP PS Driver B99F51CD5A3D43568DBA656796A2D9F4
Where:
1;
Comment:
Printer created by TPAutoConnect
Print to file
Print range
All
Pages
from:
1
to:
1
Selection
Copies
Number of copies:
1
Collate
Print Frames
As laid out on the screen
The selected frame
Each frame separately
OK
Cancel


Print
Printer: CS-BW2
Presets: Default Settings
Copies & Pages
Copies: 1
Collated
Pages:
All
Current Page
Selection
From: 1
to: 1
Page Range
Enter page numbers and/ or page ranges separated by commas (e.g. 2, 5-8)
1 of 1
Show Quick Preview
PDF
Cancel
Print


Print
Printer: OLSSON-228
Presets: Standard
Copies & Pages
Assessment Report: Sept. 2010
BS in Computer Science
University of Virginia
Lead author: Thomas R. Horton
Copies: 1
Collated
Pages:
All
Current Page
Selection
From: 1
to: 1
Page Range
Enter page numbers and/or page ranges separated by commas (e.g. 2, 5-8)
1 of 44
Show Quick Preview
Page Setup...
PDF
Preview
Cancel
Print


Print
General
Page Setup
Page Handling
Job
Color
Advanced
Printer
Location
Status
Print to File
Brother_MFC-7820N
Host OS
CS-BW1
Host OS
CS-BW2
Host OS
CS-COLOR1
Host OS
CS-COLOR2
Host OS
HP-Color-LaserJet-8500
ubuntu
Print_to_PDF_(Mac_Desktop)
Host OS
Range
All Pages
Current Page
Pages:
Copies
Copies:
1
Collate
Reverse
Preview
Cancel
Print

5
PH
3
4
1R
2
B
★1
FRONT
REAR
DOOR OPEN
DOOR CLOSE
DOOR OPEN
DOOR CLOSE
RUN
STOP

4
5
2
3
B
★1
DOOR OPEN
DOOR CLOSE
ALARM
RUN
STOP
RECEIVED
HELP