Lecture 12 – Models 4
Form-Oriented Analysis

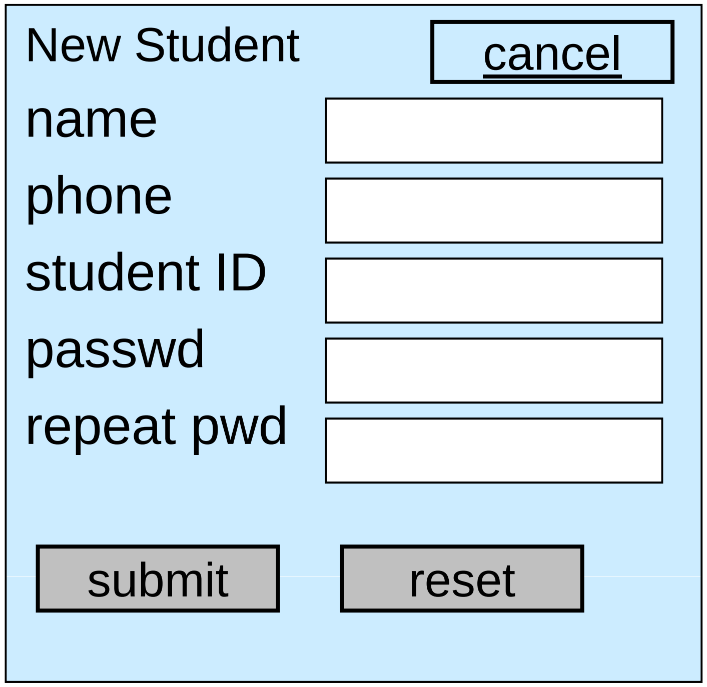
Dr Gerald Weber

(NOT in textbook – see paper by Draheim and Weber)

Form-based Interfaces

- The form-oriented interface style is technology-independent.
- Form-based user interfaces
  - Paper form metaphor
  - UI contains forms in which information can be entered
  - Forms can be decomposed into fields, i.e., designated places where individual values can be entered
  - Information of form is sent to the system
- Form-based UIs are often overlooked
  - They are not sophisticated
  - There are other fascinating interface metaphors (e.g. desktop metaphor)
  - BUT: form-based interfaces are very important in practice

Forms at the user interface

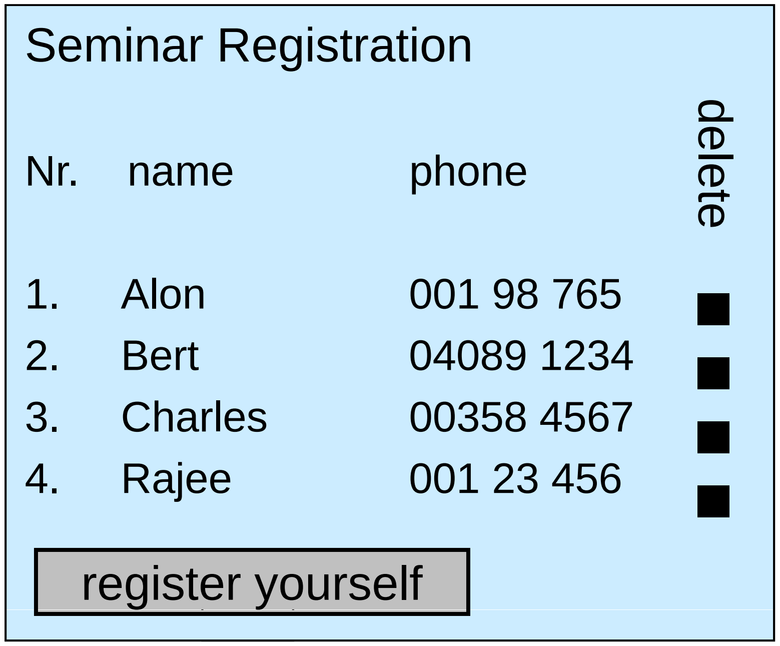


New Student

cancel

name	
phone	
student ID	
passwd	
repeat pwd	

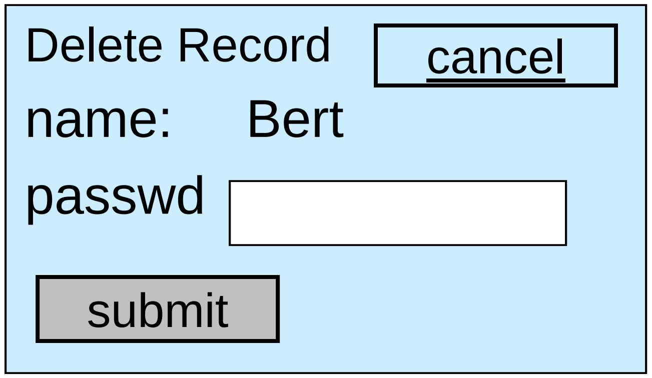
submit reset



Seminar Registration

Nr.	name	phone	delete
1.	Alon	001 98 765	■
2.	Bert	04089 1234	■
3.	Charles	00358 4567	■
4.	Rajee	001 23 456	■

register yourself



Delete Record

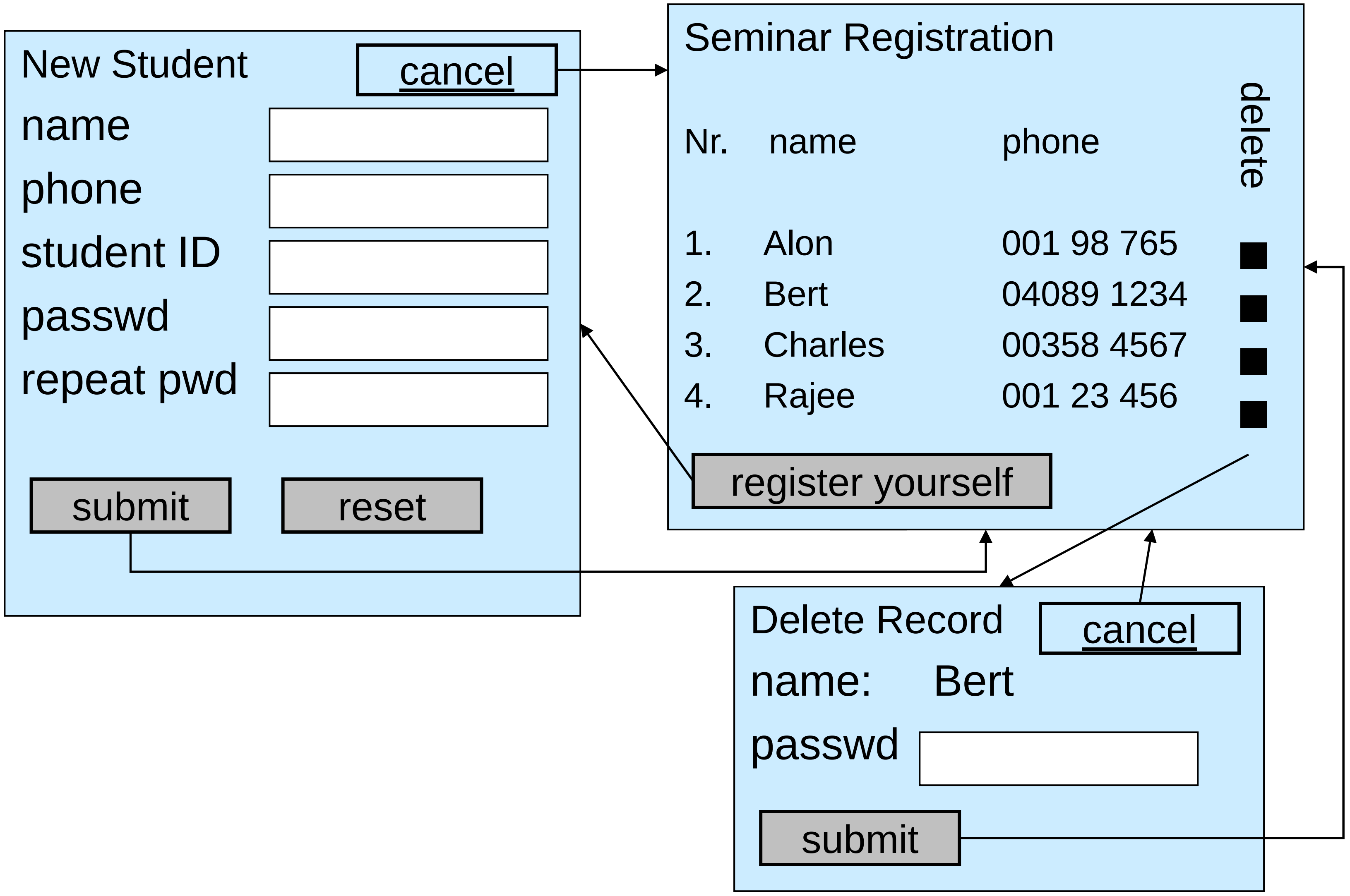
cancel

name: Bert

passwd

submit

Pages interact with each other



Observation

- We observe a: **Two-Stage Interaction**
- **Page interaction**:
  - Filling out a form (e.g. on a webpage)
  - only referring to next page change
  - Can usually be reset (deleted, undone)
  - Is **ephemeral**: no permanent effect on the system yet
- **Page change**
  - triggered e.g. by pressing the submit button
  - may irrevocably update the system state.
  - Delivers new system-generated page.
  - DB analogy: like committing a transaction
  - Programming analogy: like a method call after setting the argument values

Submit/Response Style Interfaces

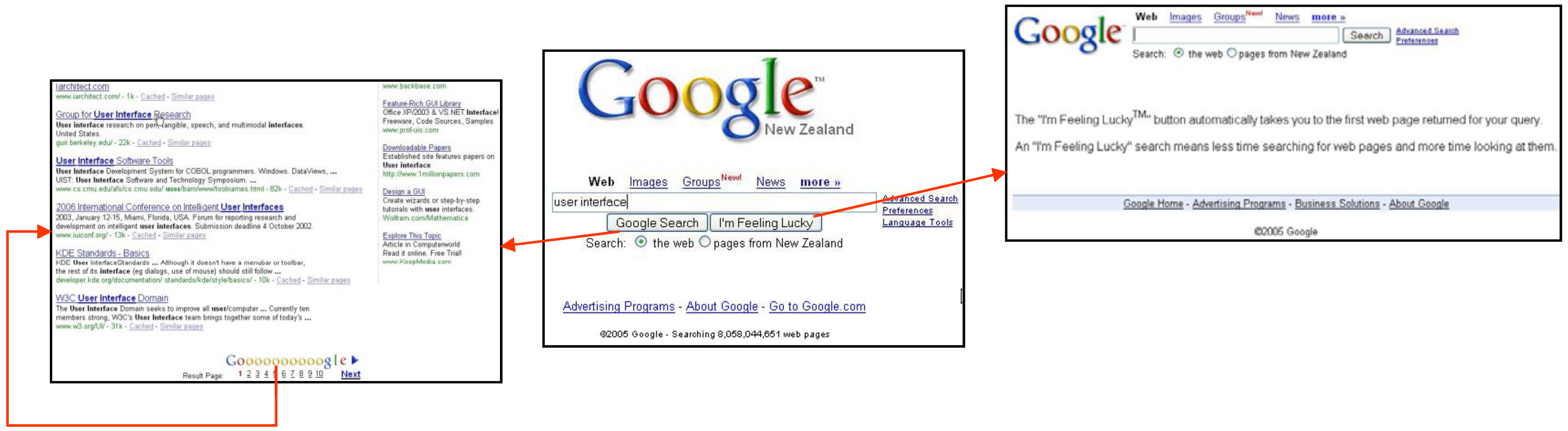
- A precise class of form-based interfaces: submit/response style interfaces (Form Oriented Analysis [Draheim, Weber])
- Defined by a two-stage interaction paradigm:
  - page interaction: ephemeral interaction within a page:
  - page change: atomic, submit
- Submit/response is form-based, but not vice versa
  - Web interfaces are submit/response style.
  - Other form-based interfaces are possible
    - form as a constantly updated view on data: desktop databases, spreadsheets

Form-Oriented Analysis

- Systems specification methodology tailored to **submit/response-style** interfaces
- Descriptive approach, artifact orientation
- Message-based user interaction
- System interface model is...
  - given by a **typed bipartite finite state machine**
  - annotated with **dialogue constraints** for…
    - specifying system reaction
    - narrowing dialogue capabilities
  - visualized by the **formchart**
- Modelling method for these systems allows tools for
  - generating a system from a model
  - reverse engineering: infer a model from the system

Submit/response-style systems

- Submit/response style applications are ubiquitous and technology independent:
  - web applications (including mobile WAP)
  - mainframe/terminal systems
  - 4GL/client/server
- Typical behaviour
  1. Information is received and displayed to a user
  2. User can submit information to the system/server (through a **form**)
  3. System responds, back to 1.



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User interface research on pen, tangible, speech, and multimodal **interfaces**. United States.
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User Interface Software Tools
User Interface Development System for COBOL programmers. Windows. DataViews, ... UIST: **User Interface** Software and Technology Symposium. ...
www.cs.cmu.edu/afs/cs.cmu.edu/ **user**/bam/www/toolnames.html - 82k - Cached - Similar pages

2006 International Conference on Intelligent **User Interfaces**
2003, January 12-15, Miami, Florida, USA. Forum for reporting research and development on intelligent **user interfaces**. Submission deadline 4 October 2002.
www.iuiconf.org/ - 13k - Cached - Similar pages

KDE Standards - Basics
KDE **User** InterfaceStandards ... Although it doesn't have a menubar or toolbar, the rest of its **interface** (eg dialogs, use of mouse) should still follow ...
developer.kde.org/documentation/ standards/kde/style/basics/ - 10k - Cached - Similar pages

W3C **User Interface** Domain
The **User Interface** Domain seeks to improve all **user**/computer ... Currently ten members strong, W3C's **User Interface** team brings together some of today's ...
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www.backbase.com

Feature-Rich GUI Library
Office XP/2003 & VS.NET **Interface**! Freeware, Code Sources, Samples
www.prof-uis.com

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user interface

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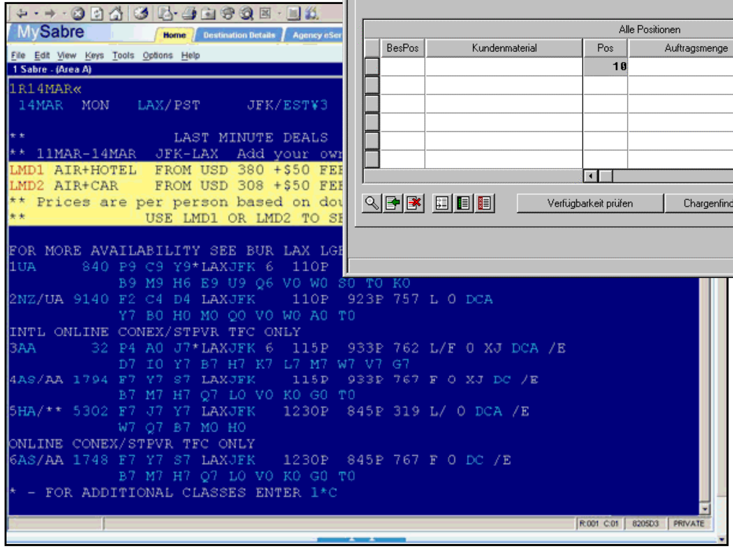
Submit/response-style interfaces

- Role-dependent viewpoints
  - Domain expert:
    - Paper form metaphor first approximation
    - Submit forms slightly different since volatile
  - Software engineer: form as editable method call
- Form-based interfaces have advantages
  - Submit form metaphor intuitive
  - Two-stage interaction and method call interpretation fits to business semantics
  - Submit/response-style interfaces for submit/response-style applications, which are frequent

Enterprise systems

- Online transaction processing systems (OLTP), e.g., SABRE flight reservation
- Enterprise resource planning systems (ERP), e.g., SAP R/3
- B2B e-commerce / Electronic data interchange (EDI), e.g., EDIS
- B2C e-commerce, e.g., Amazon



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**                  USE LMD1 OR LMD2 TO SE

FOR MORE AVAILABILITY SEE BUR LAX LGE
1UA     840 P9 C9 Y9*LAXJFK 6  110P
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2NZ/UA 9140 F2 C4 D4 LAXJFK    110P  923P 757 L 0 DCA
            Y7 B0 H0 M0 Q0 V0 W0 A0 T0
INTL ONLINE CONEX/STPVR TFC ONLY
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4AS/AA 1794 F7 Y7 S7 LAXJFK    115P  933P 767 F 0 XJ DC /E
            B7 M7 H7 Q7 L0 V0 K0 G0 T0
5HA/** 5302 F7 J7 Y7 LAXJFK   1230P  845P 319 L/ 0 DCA /E
            W7 Q7 B7 M0 H0
ONLINE CONEX/STPVR TFC ONLY
6AS/AA 1748 F7 Y7 S7 LAXJFK   1230P  845P 767 F 0 DC /E
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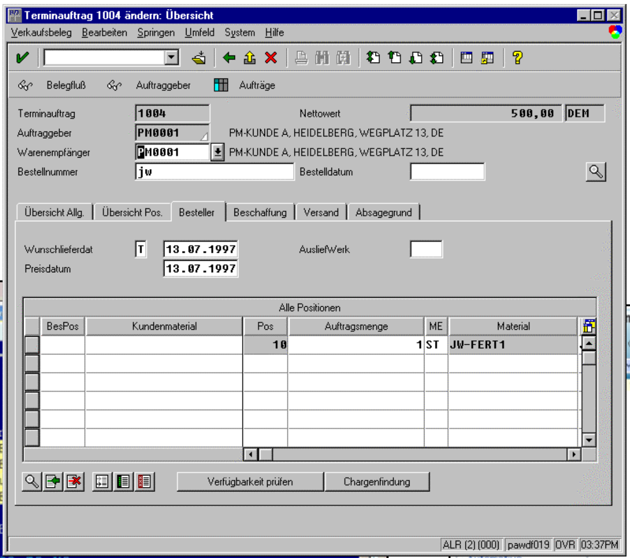

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Warenempfänger	PM0001	PM-KUNDE A, HEIDELBERG, WEGPLATZ 13, DE	
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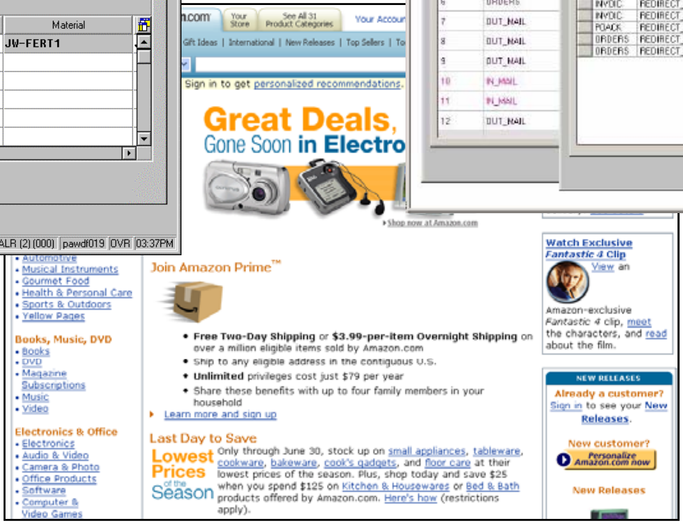

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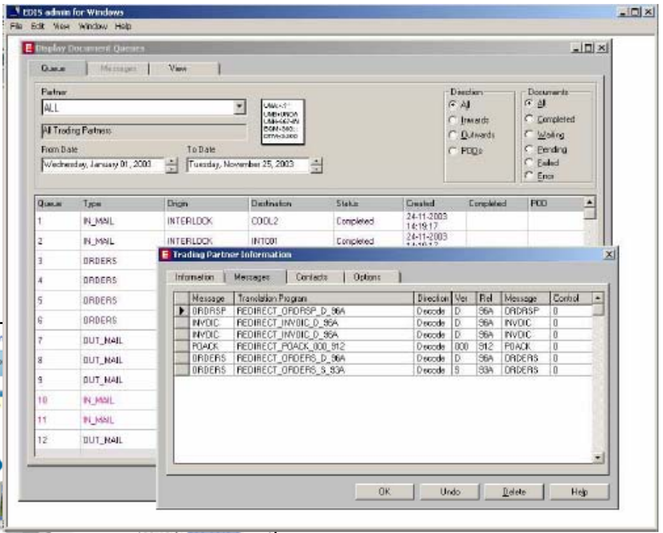


Partner	ALL	Direction	[✓ All] Inwards Outwards PODs
	All Trading Partners	Documents	[✓ All] Completed Waiting Pending Failed Error
From Date	Wednesday, January 01, 2003	To Date	Tuesday, November 25, 2003

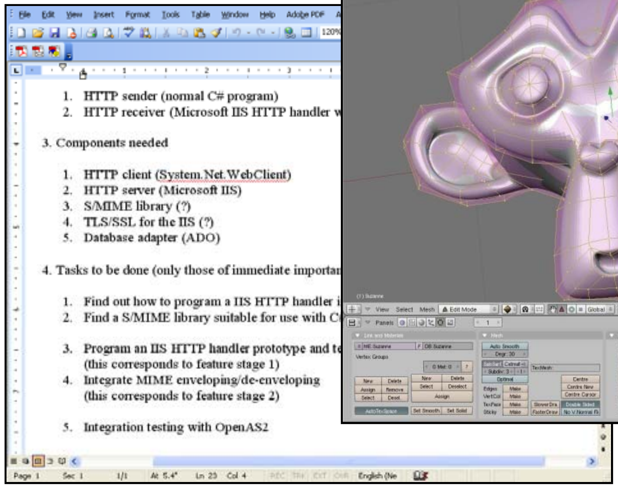
Queue	Type	Origin	Destination	Status	Created	Completed	POD
1	IN_MAIL	INTERLOCK	CODL2	Completed	24-11-2003 14:19:17		
2	IN_MAIL	INTERLOCK	INTC01	Completed	24-11-2003		
3	ORDERS						
4	ORDERS						
5	ORDERS						
6	ORDERS						
7	OUT_MAIL						
8	OUT_MAIL						
9	OUT_MAIL						
10	IN_MAIL						
11	IN_MAIL						
12	OUT_MAIL						

Message	Translation Program	Direction	Ver	Rel	Message	Control
ORDRSP	REDIRECT_ORDRSP_D_96A	Decode	D	96A	ORDRSP	0
INVOIC	REDIRECT_INVOIC_D_96A	Decode	D	96A	INVOIC	0
INVOIC	REDIRECT_INVOIC_D_96A	Decode	D	96A	INVOIC	0
POACK	REDIRECT_POACK_000_912	Decode	000	912	POACK	0
ORDERS	REDIRECT_ORDERS_D_96A	Decode	D	96A	ORDERS	0
ORDERS	REDIRECT_ORDERS_S_93A	Decode	S	93A	ORDERS	0

Not submit/response-style

Many systems are submit/response-style, but not all:

- Interactive systems with **immediate feed-back** to user, i.e., no explicit submission
  (e.g. many content creation systems)
- **Active** systems, i.e., not just responsive
  (e.g. flash animations, Javascript effects, applets)
- **Real-time** systems (e.g. computer games)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1. HTTP sender (normal C# program)
2. HTTP receiver (Microsoft IIS HTTP handler w

3. Components needed

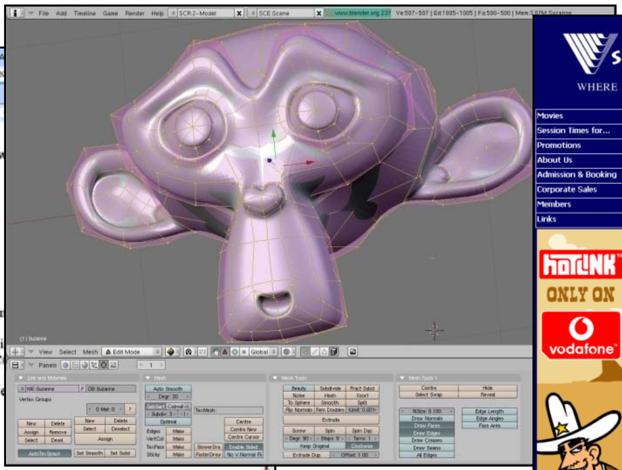
1. HTTP client (System.Net.WebClient)
2. HTTP server (Microsoft IIS)
3. S/MIME library (?)
4. TLS/SSL for the IIS (?)
5. Database adapter (ADO)

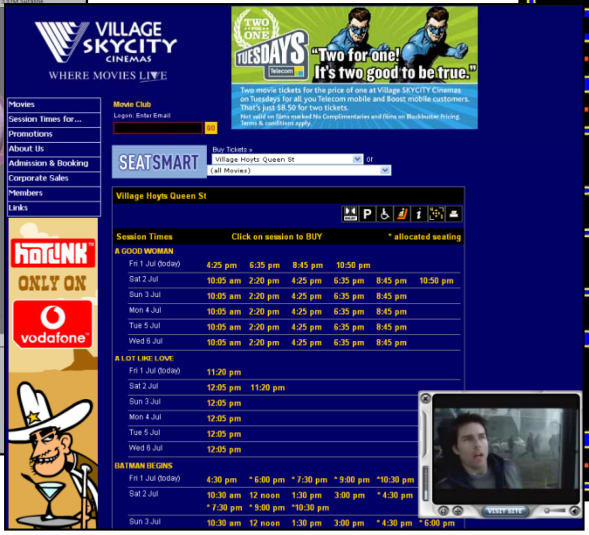
4. Tasks to be done (only those of immediate importan

1. Find out how to program a IIS HTTP handler i
2. Find a S/MIME library suitable for use with C

3. Program an IIS HTTP handler prototype and te
   (this corresponds to feature stage 1)
4. Integrate MIME enveloping/de-enveloping
   (this corresponds to feature stage 2)

5. Integration testing with OpenAS2





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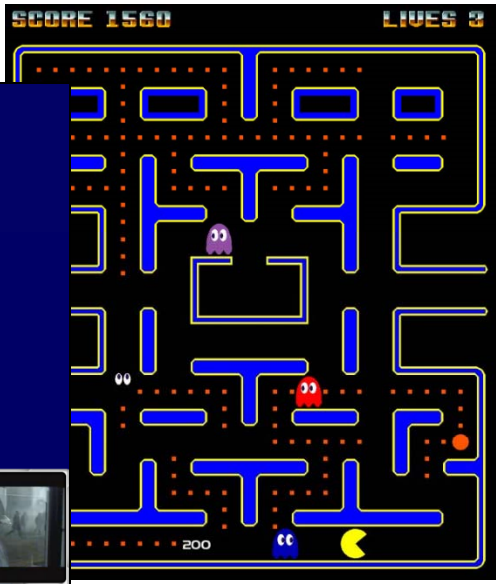
Session Times — Click on session to BUY — * allocated seating

A GOOD WOMAN						
Fri 1 Jul (today)	4:25 pm	6:35 pm	8:45 pm	10:50 pm		
Sat 2 Jul	10:05 am	2:20 pm	4:25 pm	6:35 pm	8:45 pm	10:50 pm
Sun 3 Jul	10:05 am	2:20 pm	4:25 pm	6:35 pm	8:45 pm	
Mon 4 Jul	10:05 am	2:20 pm	4:25 pm	6:35 pm	8:45 pm	
Tue 5 Jul	10:05 am	2:20 pm	4:25 pm	6:35 pm	8:45 pm	
Wed 6 Jul	10:05 am	2:20 pm	4:25 pm	6:35 pm	8:45 pm	
A LOT LIKE LOVE						
Fri 1 Jul (today)	11:20 pm					
Sat 2 Jul	12:05 pm	11:20 pm				
Sun 3 Jul	12:05 pm					
Mon 4 Jul	12:05 pm					
Tue 5 Jul	12:05 pm					
Wed 6 Jul	12:05 pm					
BATMAN BEGINS						
Fri 1 Jul (today)	4:30 pm	* 6:00 pm	* 7:30 pm	* 9:00 pm	*10:30 pm	
Sat 2 Jul	10:30 am	12 noon	1:30 pm	3:00 pm	* 4:30 pm	
	* 7:30 pm	* 9:00 pm	*10:30 pm			
Sun 3 Jul	10:30 am	12 noon	1:30 pm	3:00 pm	* 4:30 pm	* 6:00 pm

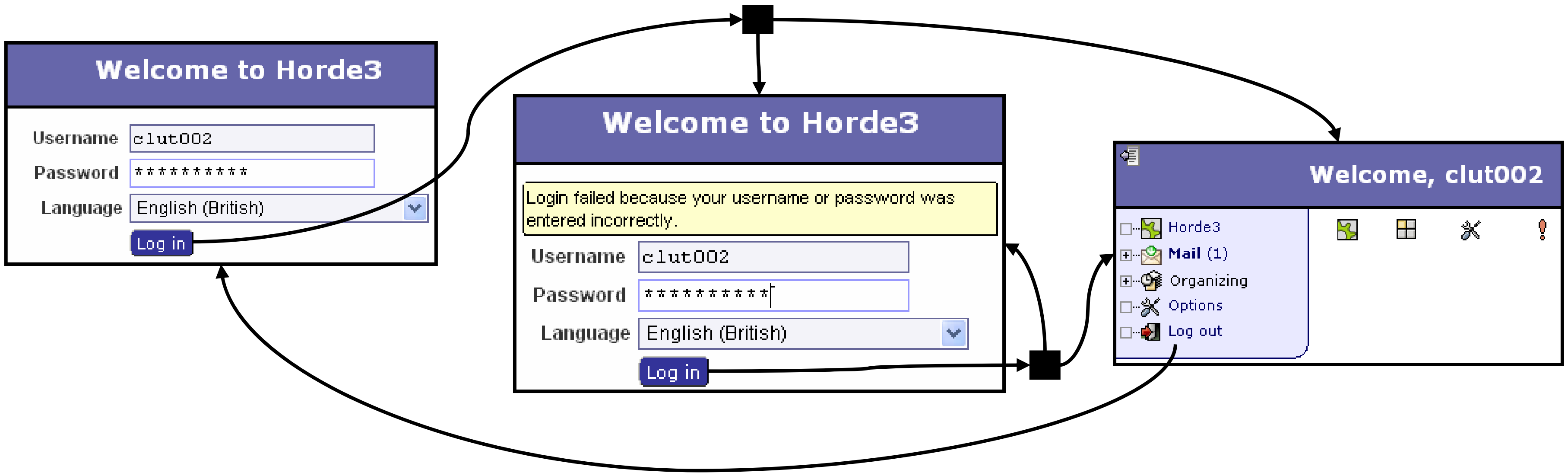


System modelling

- **Model**: targeted translation of original into a different object that resembles the original in certain aspects
- Why modelling?
  - **Reduction of complexity**: models targeted to describe particular aspects
    Not interested in all aspects but only those seen as important
  - **Illustration**: models try to clarify the aspects they describe
    Original may not show interesting aspects clearly
  - **Perspective**: many models for the same original
    Different models for different purposes / different people
- Formal vs. informal models
  - **Informal**: often more intuitive (e.g. natural language)
    but usually ambiguous; no well-defined semantics
  - **Formal**: should be unambiguous, but sometimes complicated
    can easier be translated into other representation (e.g. forward-engineering)
- Desired properties of models
  - Easy to comprehend:
    less complex (abstract), intuitive, clearer than the original
  - Easy to use:
    inexpensive, robust, support for decomposition, annotation
  - Expressive / powerful: allows good prediction of the original’s properties

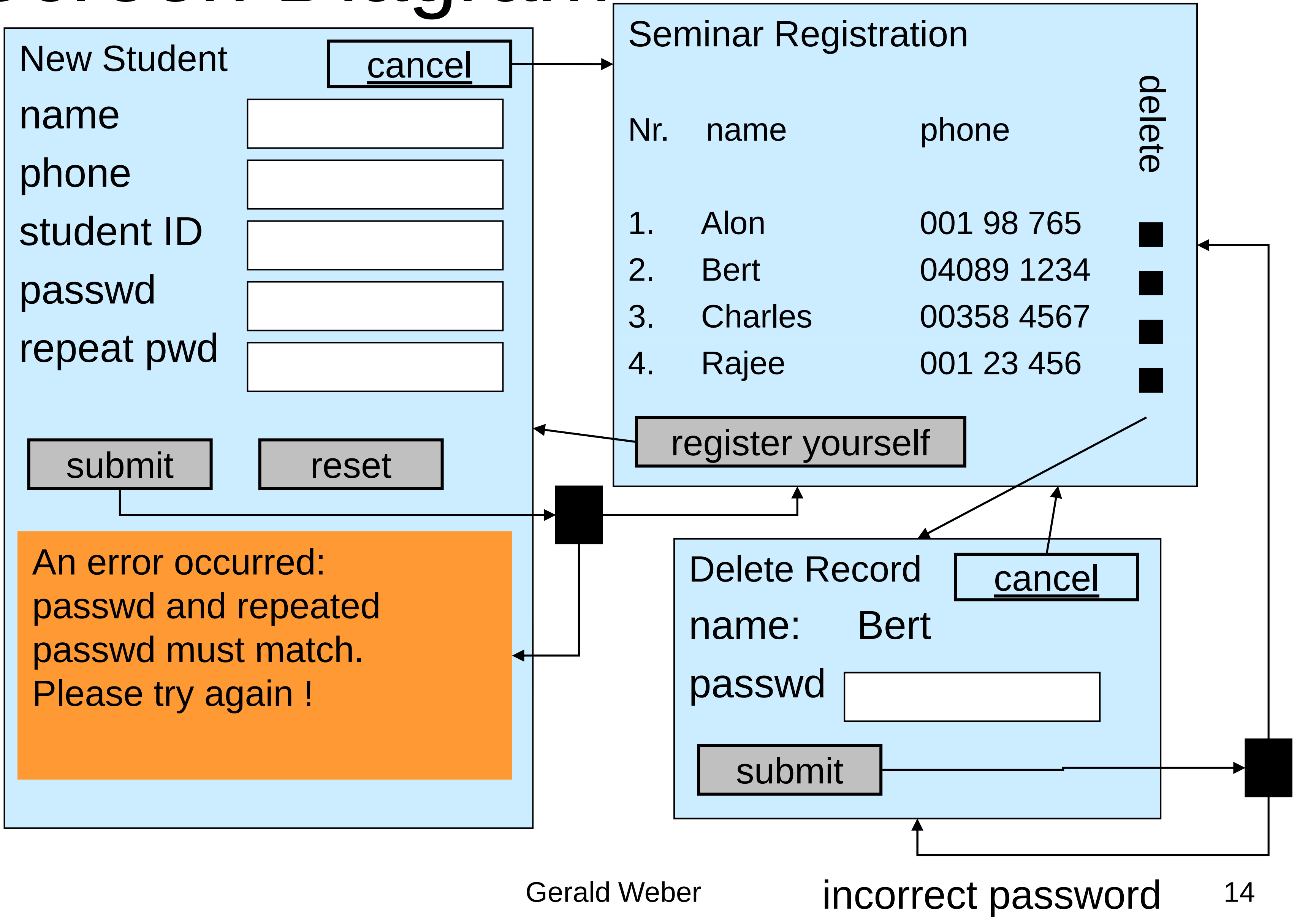
Page change is conditional

- **Change to the same page type is possible, e.g if form was filled out incorrectly.**
- **The new page is a new form, with some default values.**
- **Alternatively it can be seen as part of page interaction: compare with a disabled submit button**



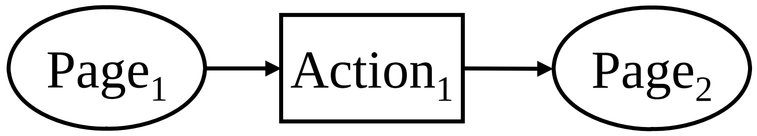
Username	clut002
Password	**********
Language	English (British)

Screen Diagram

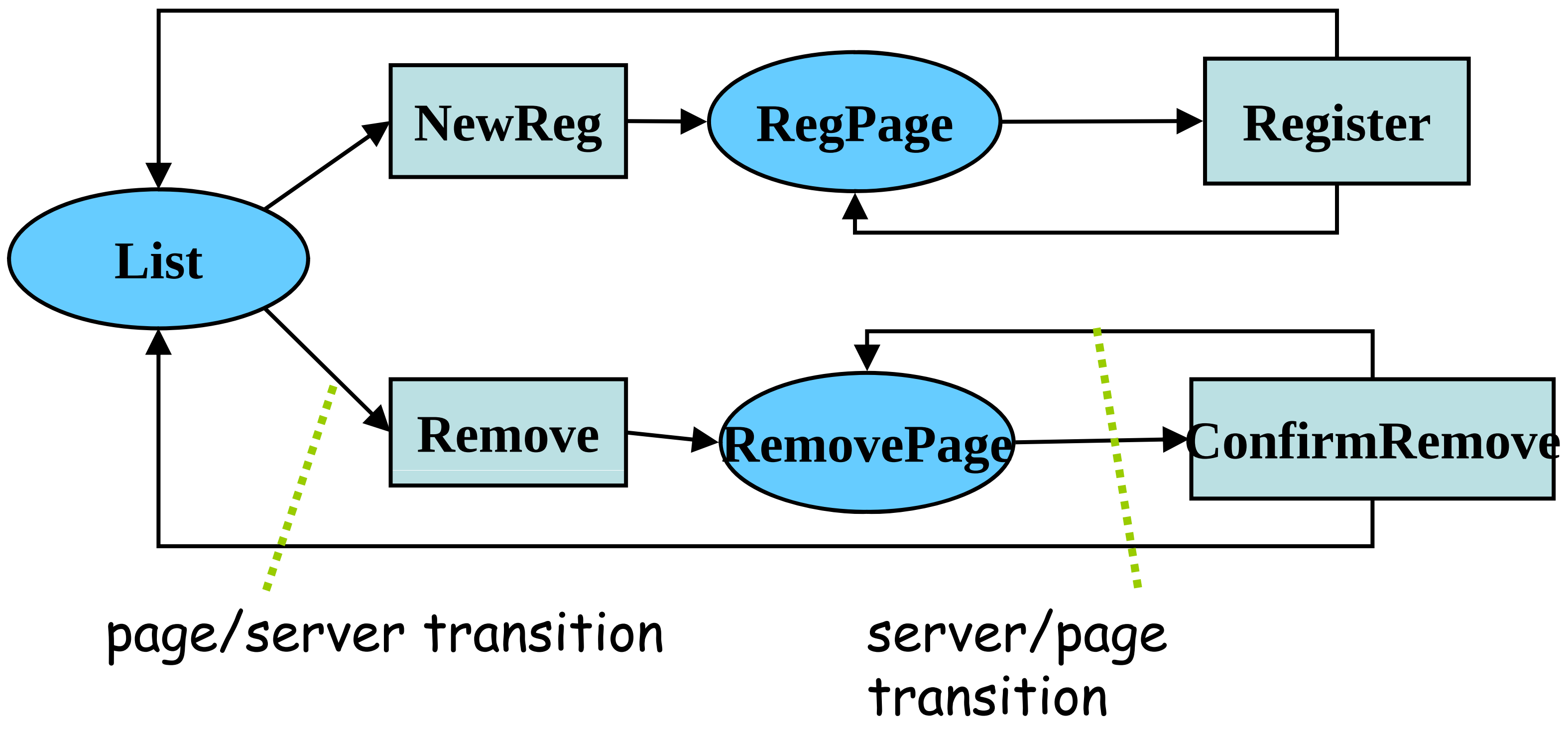


Dialogue Model

- When and what can the user submit to the system?
- When and what can the system show to the user (response)?
- Not important to model ephemeral interaction
- **Pages**:
  - Shown to the user on the client side
  - Report information
  - Offer possibilities of interaction (**forms**) to the user
- **Screen**: how a user sees a page; concrete instance of a page
- **Forms**: like paper forms; allow the user to input and submit information to **actions**
- **Actions**:
  - Active entity on the server side
  - Is invoked and gets its parameters through a form
  - Sends a result back to a page
- Visualized by **formcharts**:



Formchart for the Seminar Registration System



Formcharts are state transition diagrams that are…

- **Bipartite**: client states (pages *[denoted by ovals])* and server states (actions *[denoted by rectangles]*)
- **Typed**: a message type for each page and each action

The Layered Data Model in Form-Oriented Analysis

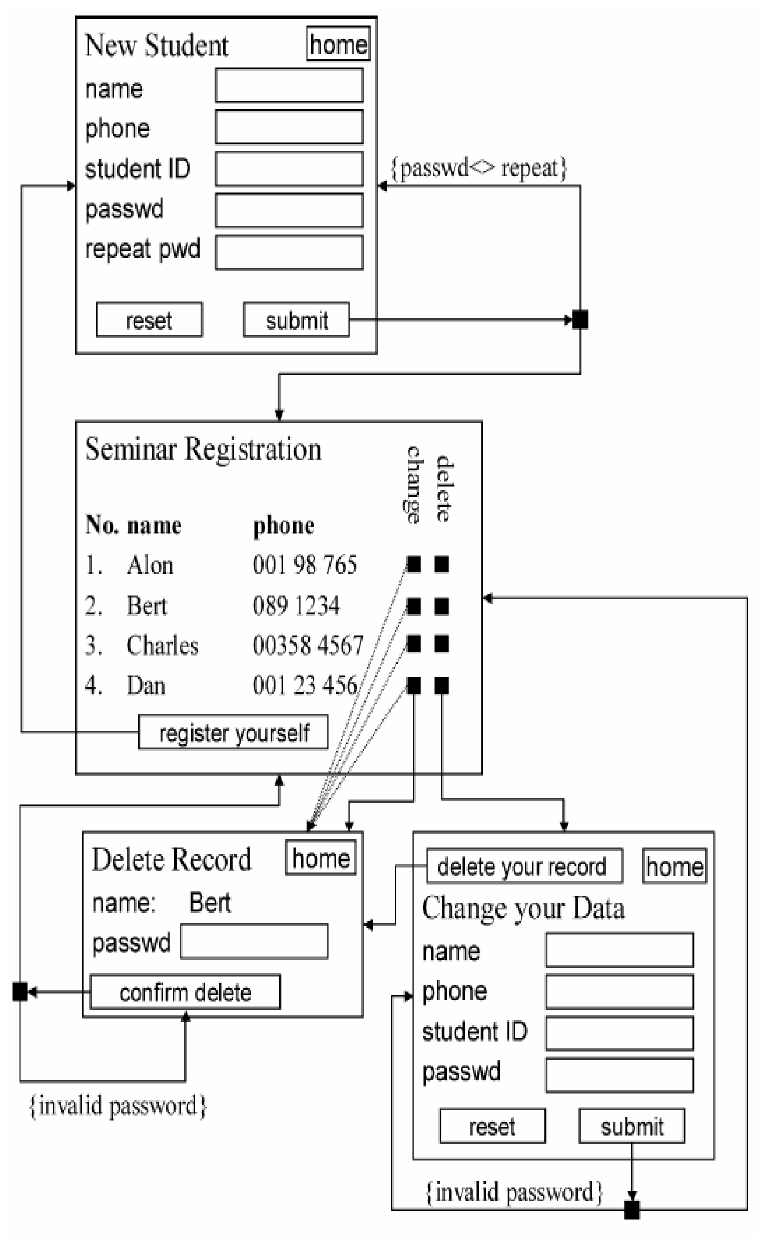
Message Model

- A message type for each page:
  for the messages sent from server actions to that client page
  (containing the data represented in the page)
- A message type for each action:
  for the messages sent from client pages to that server action (containing arguments for the action)

Information Model

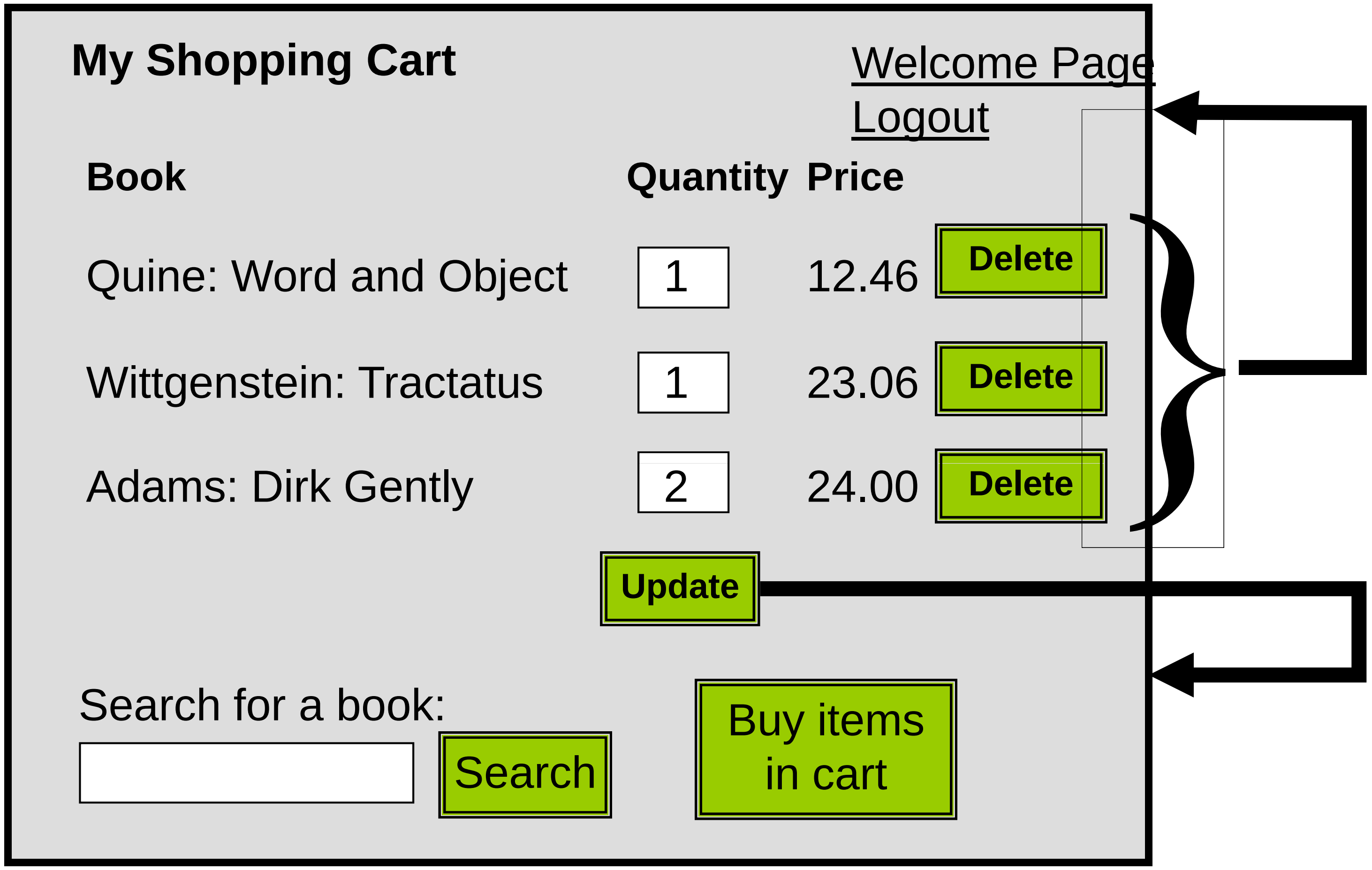
Types for the information that is kept during a session or persistently in the system (i.e. in memory or a database on the server)

Screen diagram

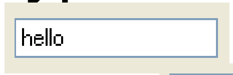


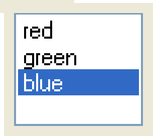
- Close to a set of screen sketches, but adding formalism
- Screens are nodes
- Transitions (arcs) are actions that take us between screens
- Alternatives are annotated
  - often one default action, unlabeled
  - Other actions (notably error handling) labeled with condition in curly braces

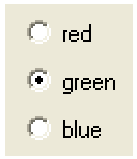
A list of options forms a single conceptual option

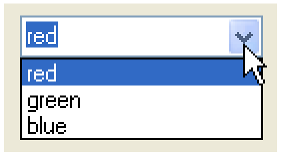


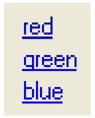
Forms, Fields and Widgets

- Forms
  - Specify which information is submitted together ("superparameter")
  - May have no visible fields (e.g. links)
- Fields
  - May be hidden to the user
  - May theoretically be shared by forms (but are usually not)
- Widget types
  - Text: 

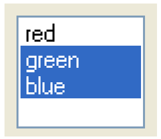
  - Single selection: 

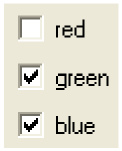




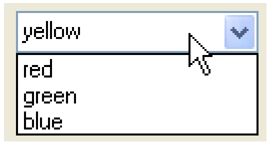


List box Radio buttons Combo box Group of links

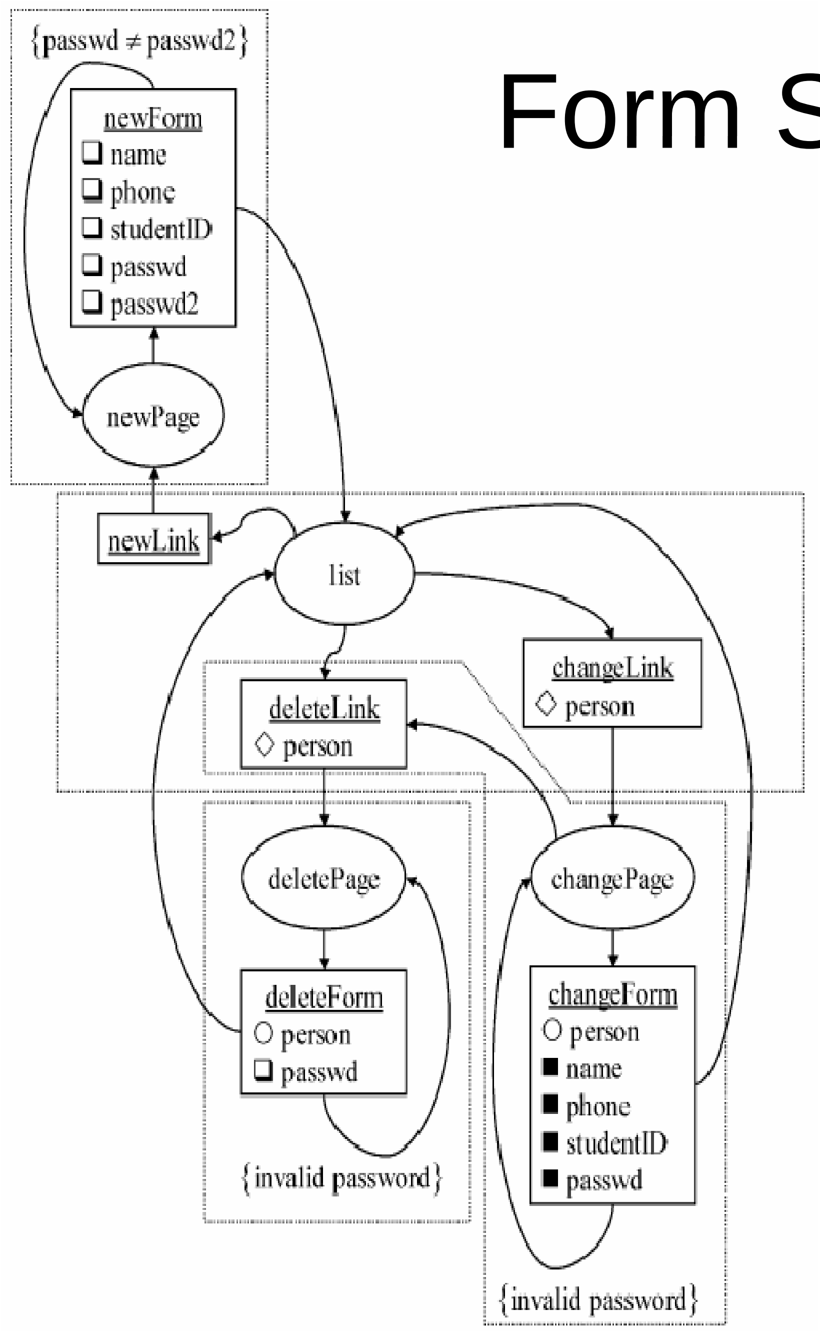
  - Multiple selection: 



List box Check boxes

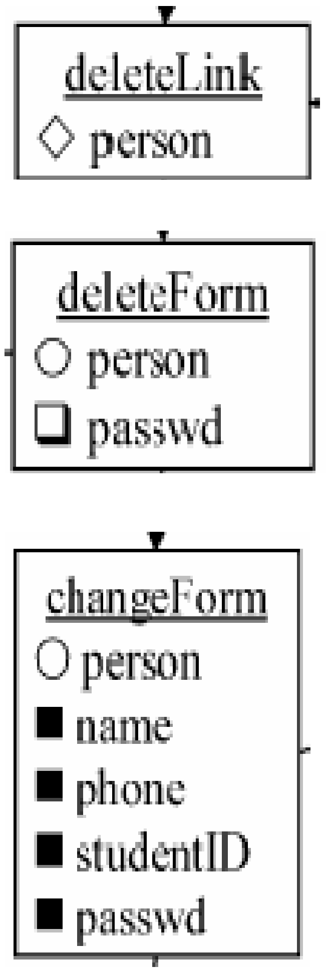
  - Hybrid: e.g. editable combo box 

Form Storyboard



- Each rectangle defines the data type of the record submitted to the server
  - E.g., ‘newForm’ and ‘changeLink’ are *records* used for *server actions* whereas ‘list’ and ‘newPage’ are *pages* or *forms*
- A *page image* is a subgraph including a form and its accessible server actions (bounded by dashed lines)
  - Note that server actions can be shared (e.g., deleteLink)

Form Storyboard Parameter Types



- Icons preceding parameters specify type of interaction
  - Rhomb (diamond) = selection link
    - Also use for other controls (e.g., list box) if they are choosing the *action* taken (e.g., list box choosing *add*, *update* or *delete*)
  - Empty square = text input field
    - Also use for other controls (e.g., combo boxes, check boxes) if they are providing parameter data other than actions
  - Solid square = text input (or other non-action data collection, e.g., via check box) with default value
  - Circle = hidden parameter

Summary

- Formcharts, Form Storyboards and Screen Diagrams give us a variety of formalised views of Form Oriented Systems at different levels of detail
- All based on the useful division of ephemeral within-page interaction and more significant ‘page change’ interaction
  - Ubiquitous with Web browsers