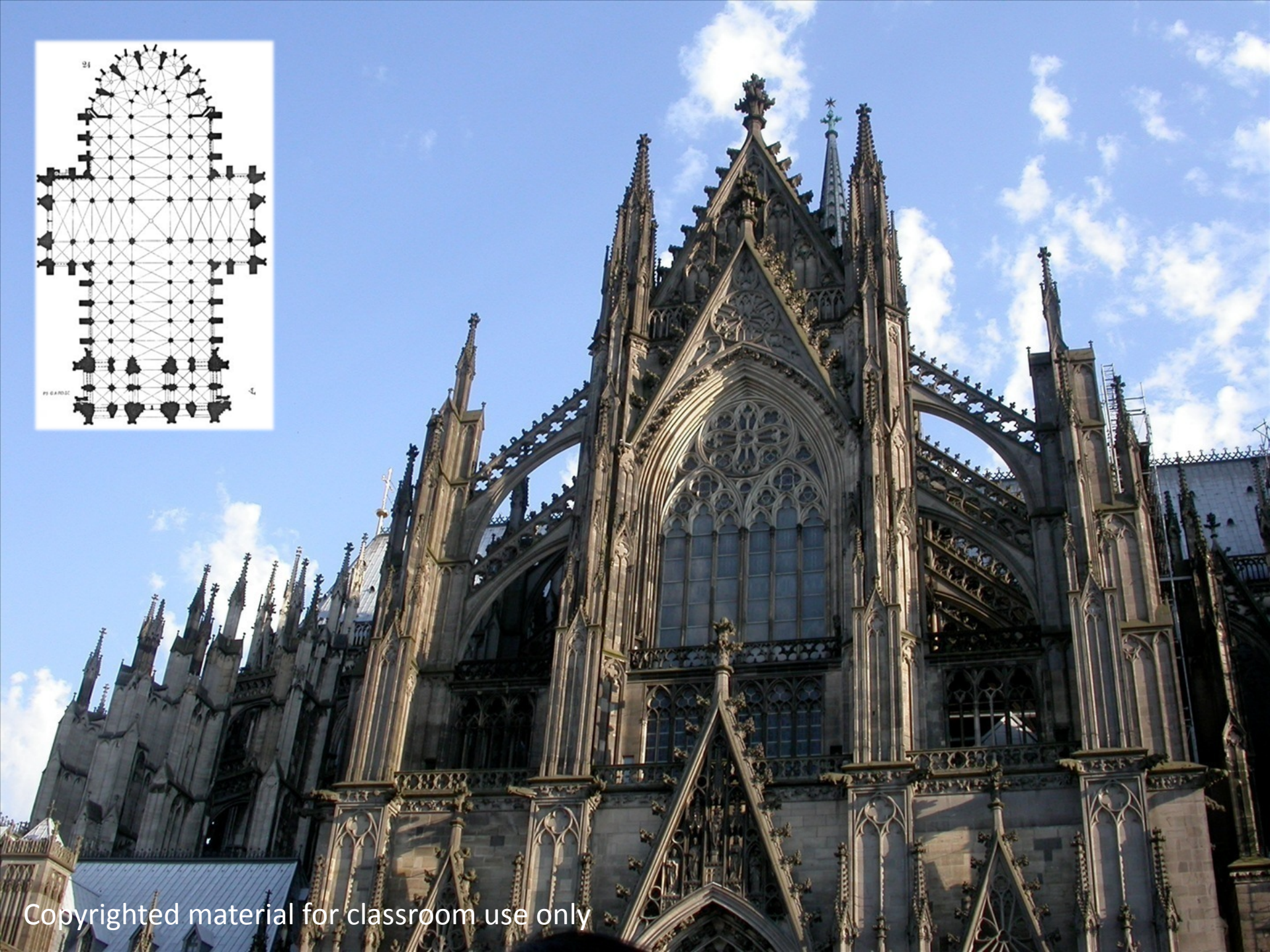
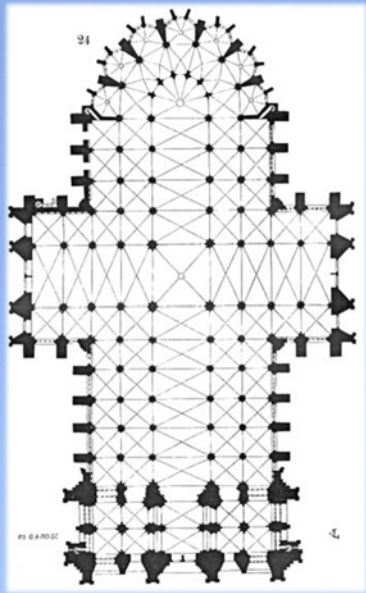


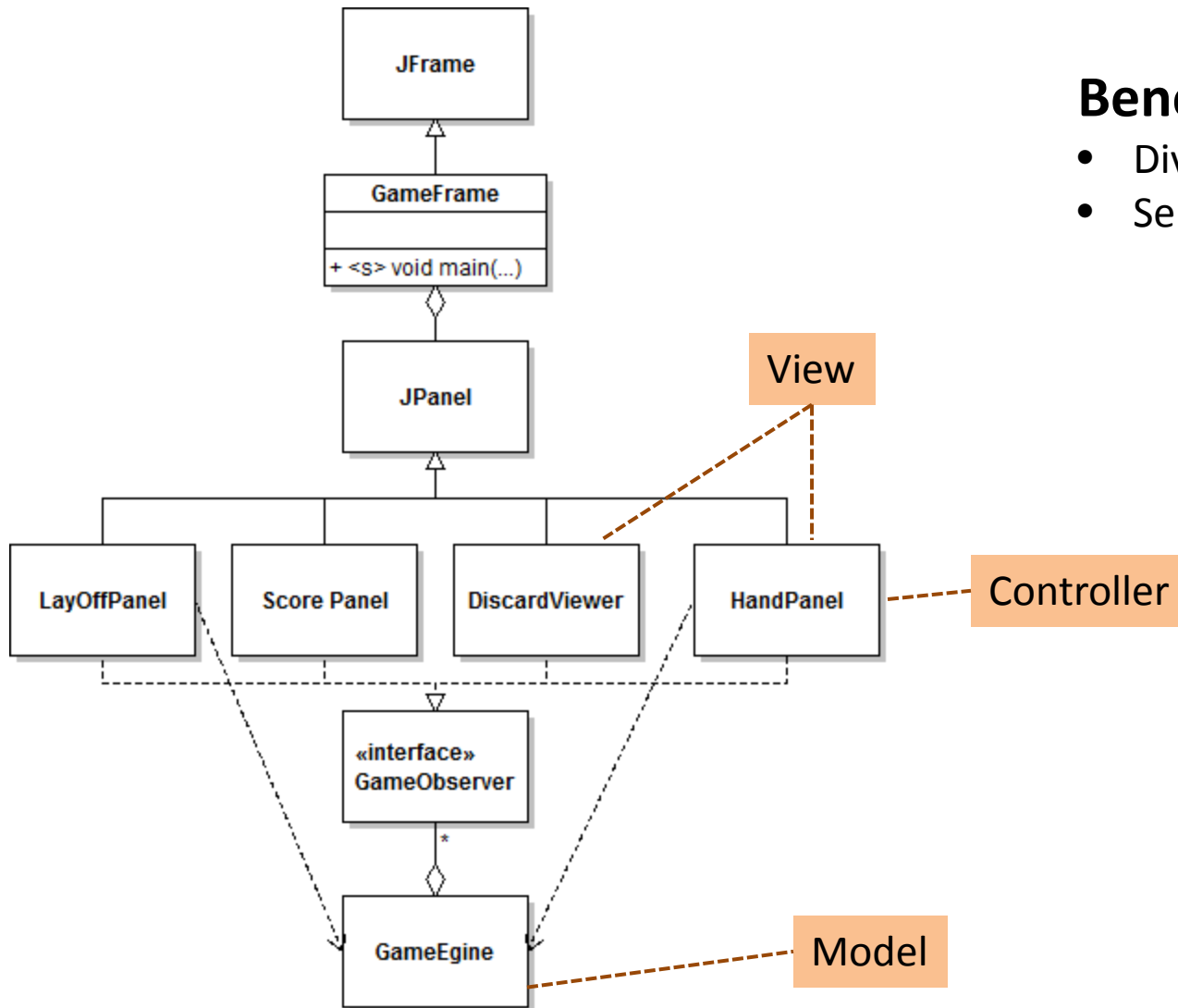
Topics in GUI Design

1. Architecture for your Gin Rummy Application
2. Model-View Coupling and Component Encapsulation
3. Thread Containment
4. Resources and Internationalization
5. GUI “Patterns”



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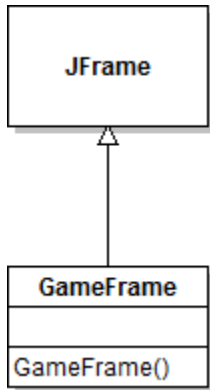
Possible Architecture for M3



Benefits of Panels:

- Divide and conquer
- Separation of concerns

GUI Construction



Don't create the entire
GUI in the Frame's constructor!
Delegate construction to
specializations of JPanel

```
public GameFrame()
{
    setTitle("Five Hundred");
    setLayout( new BorderLayout() );
    JPanel lCenterPanel = new JPanel();
    lCenterPanel.setLayout(new GridLayout(2, 1));
    add(lCenterPanel, BorderLayout.CENTER);

    // Dont'
    JPanel lCardPanel = new JPanel();
    lCardPanel.setLayout(new OverlapLayout());
    lCardPanel.setBorder(new TitledBorder( "CardPanel" ));
    lCardPanel.addMouseListener(...)|
```



```
public class CardPanel extends JPanel implements GameObserver
{
    private HashMap<JLabel,Card> aCards = new HashMap<JLabel,Card>();

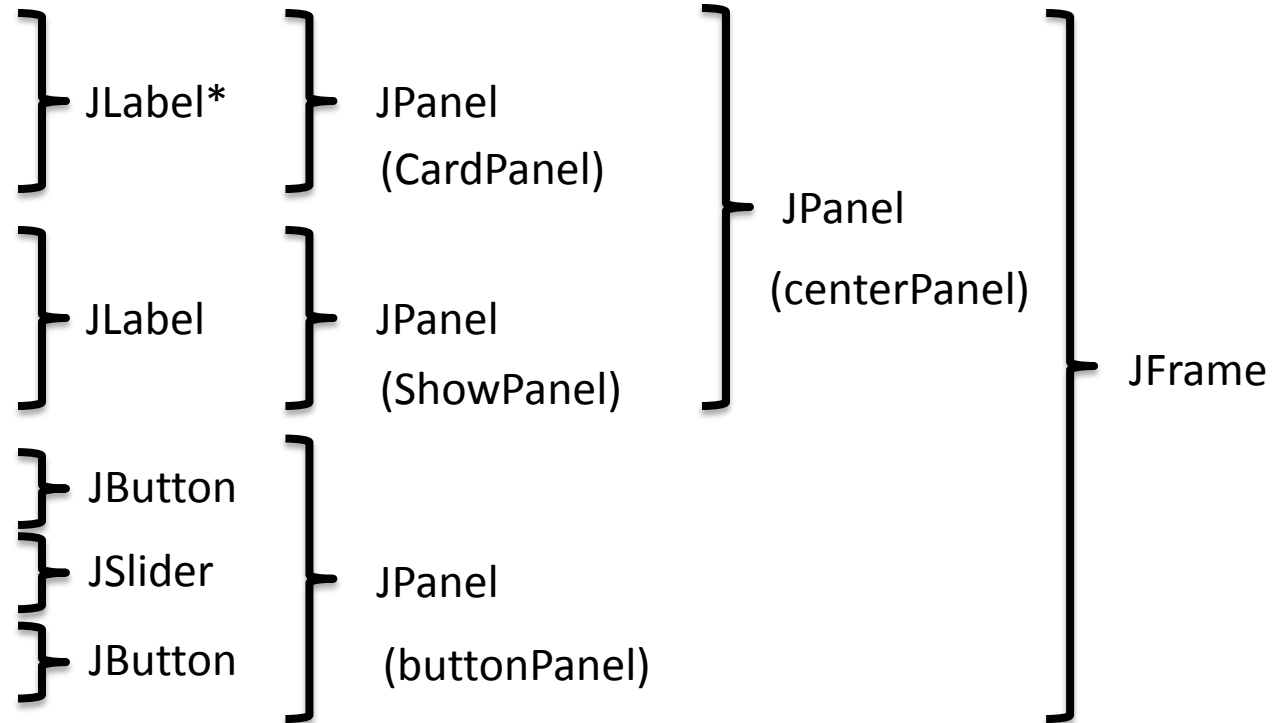
    public CardPanel()
    {
        super(new OverlapLayout(new Point(30, 0)));
        setBorder(new TitledBorder( "Martin's Hand" ));

        Insets ins = new Insets(10, 0, 0, 0);
        ((OverlapLayout)getLayout()).setPopupInsets(ins);
        setBackground( GameFrame.BACKGROUND_COLOR );
    }
}
```

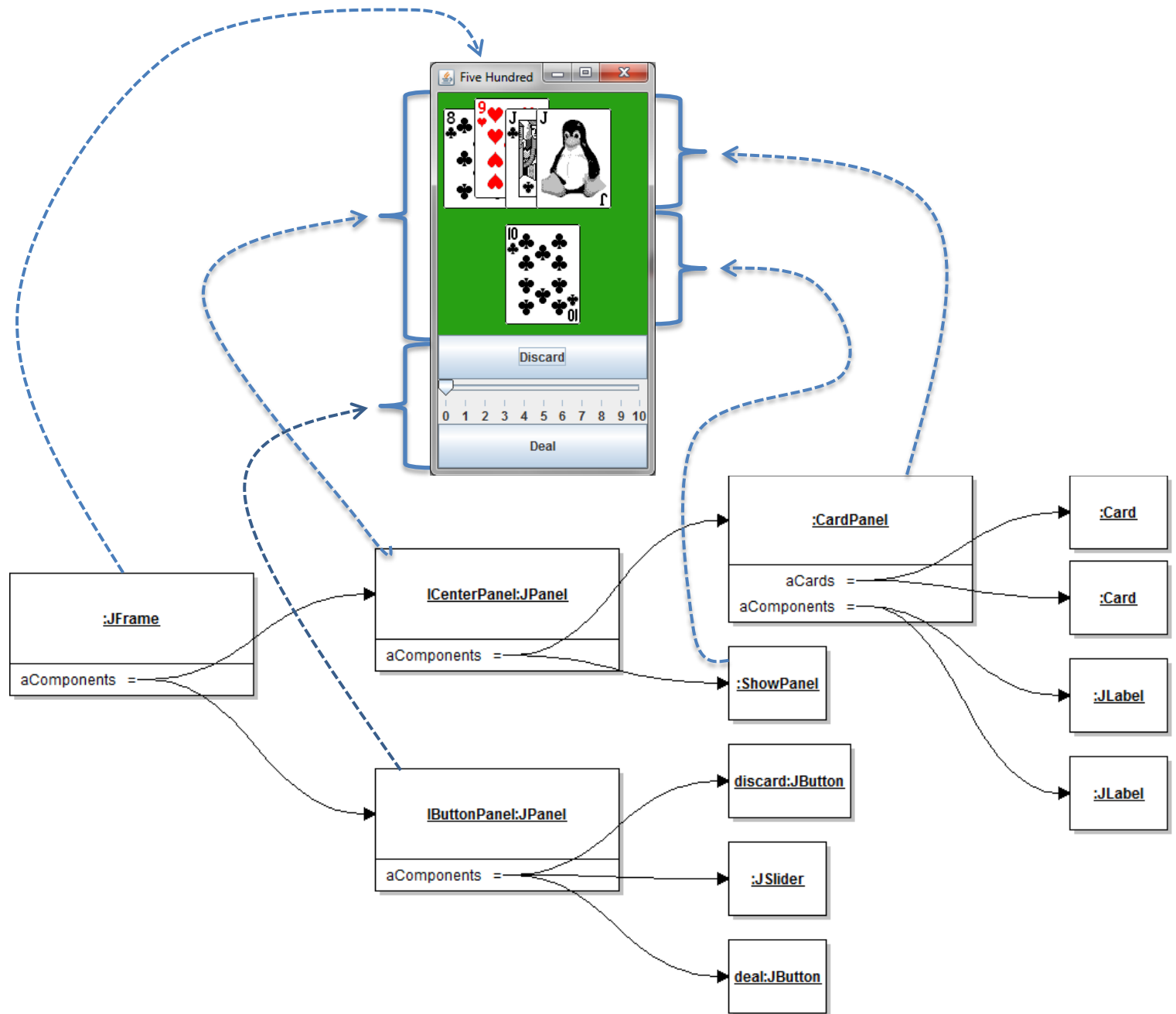
Topics in GUI Design

1. Architecture for your Gin Rummy Application
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Logical Design



Layout + Abstraction



Illustrative Problem 1:

How does the discard action figure out the discard speed from the slider?



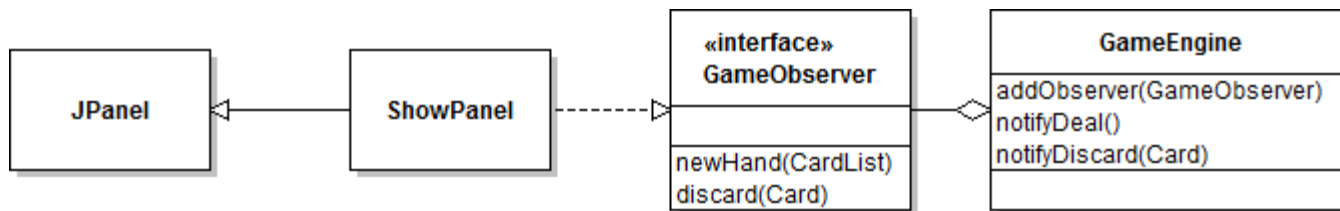
Needs to know about

How Do Views Access/Control the GUI?

1. No direct dependency
2. Access through the model
3. Access through the GUI Component Hierarchy
4. Global dependency through static variable

Tip: The first option is the simplest. The last option is the least desirable. For the two in between, it really depends on the rest of the design.

No Dependency



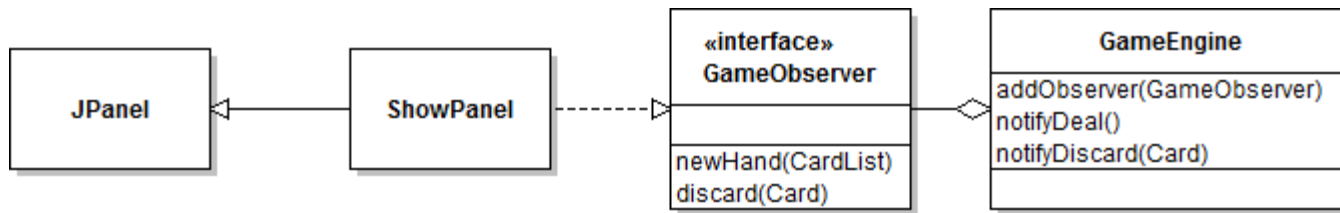
```
@Override
public void newHand(CardList pNewHand)
{
    validate();
    repaint();
}
```

```
@Override
public void discard(final Card pCard)
{
    removeAll();
    JLabel lLabel = new JLabel( CardImages.getCard(pCard));

    validate();
    repaint();
}
```

Assumes the animation speed from the slider is not used.

Through the Callback method



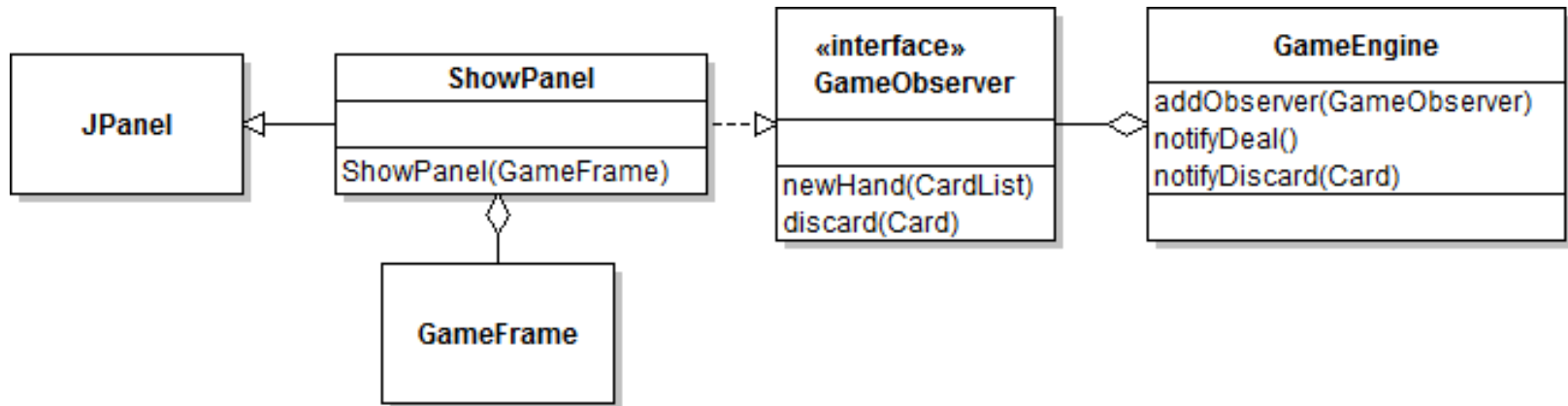
Redefine the callback?

```
public void discard(final Card pCard, JSlider pSlider )
{
```

```
public void discard(final Card pCard, GameFrame pFrame )
{
    pFrame.getSlider().
```

Or use the ISP, or use return the slider value instead of the slider...

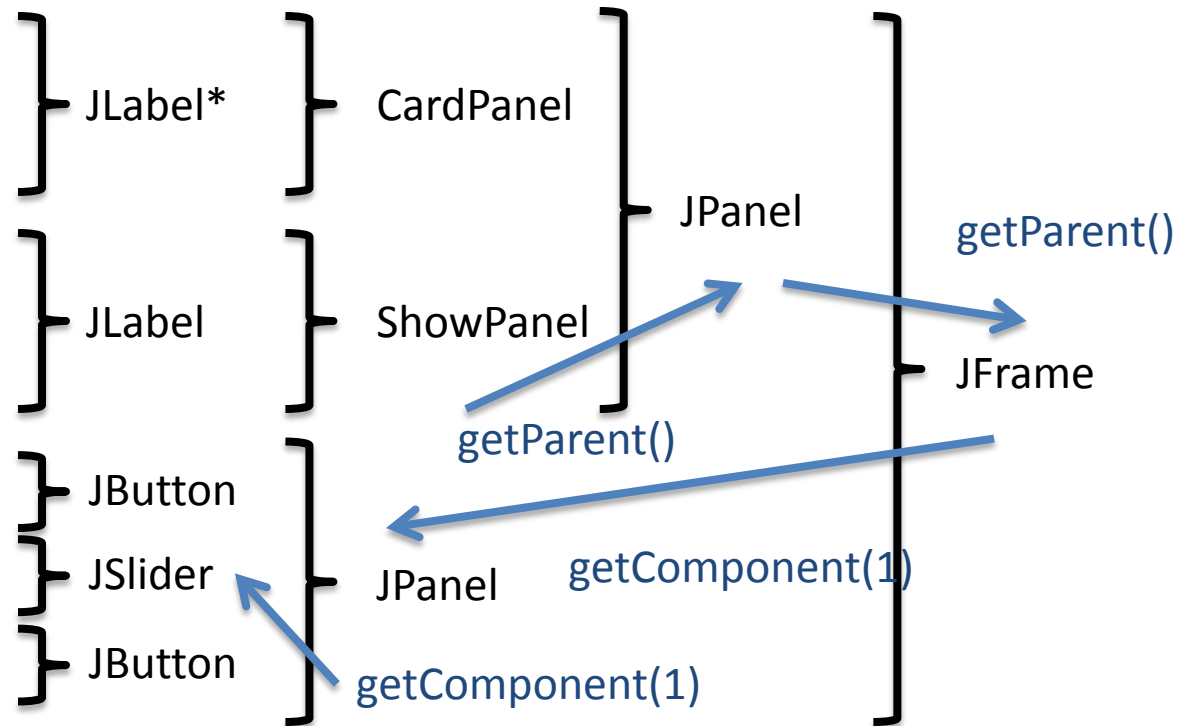
Through an Instance Variable



```
public void discard(final Card pCard )
{
    aFrame.getSlider().
```

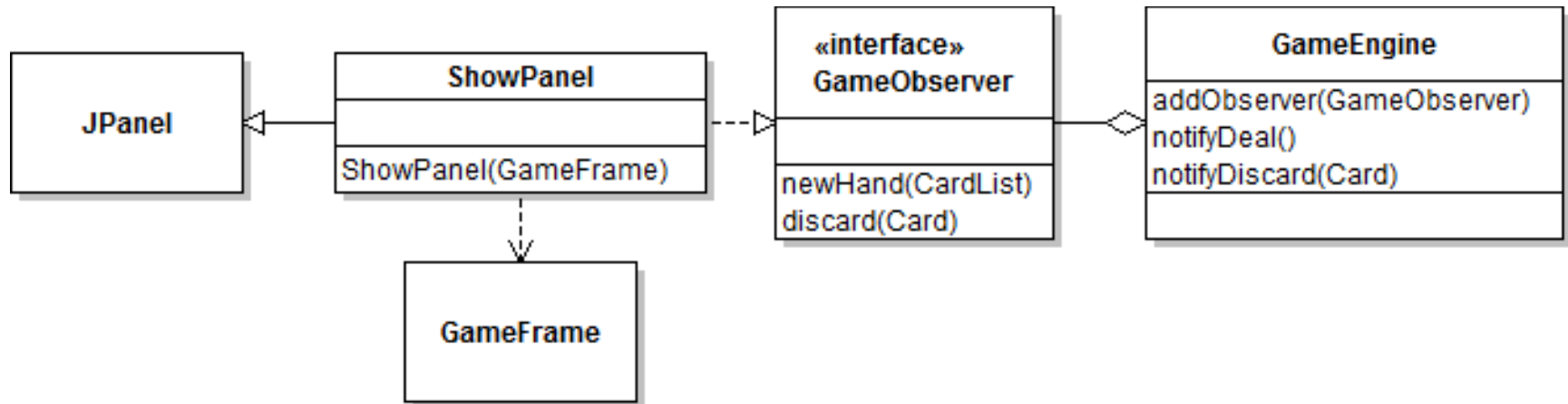
Note that you could also store the slider value in the game engine and access it through there. Is this a good idea?

Through the Component Graph



```
JSlider lSlider = (JSlider)((JPanel)getParent().getParent().getComponent(1)).getComponent(1);
```

Through a Global Variable



```
public void discard(final Card pCard )
{
    GameFrame.getInstance().getSlider().
```

Illustrative Problem 2:

How does the card panel know which cards map to labels?

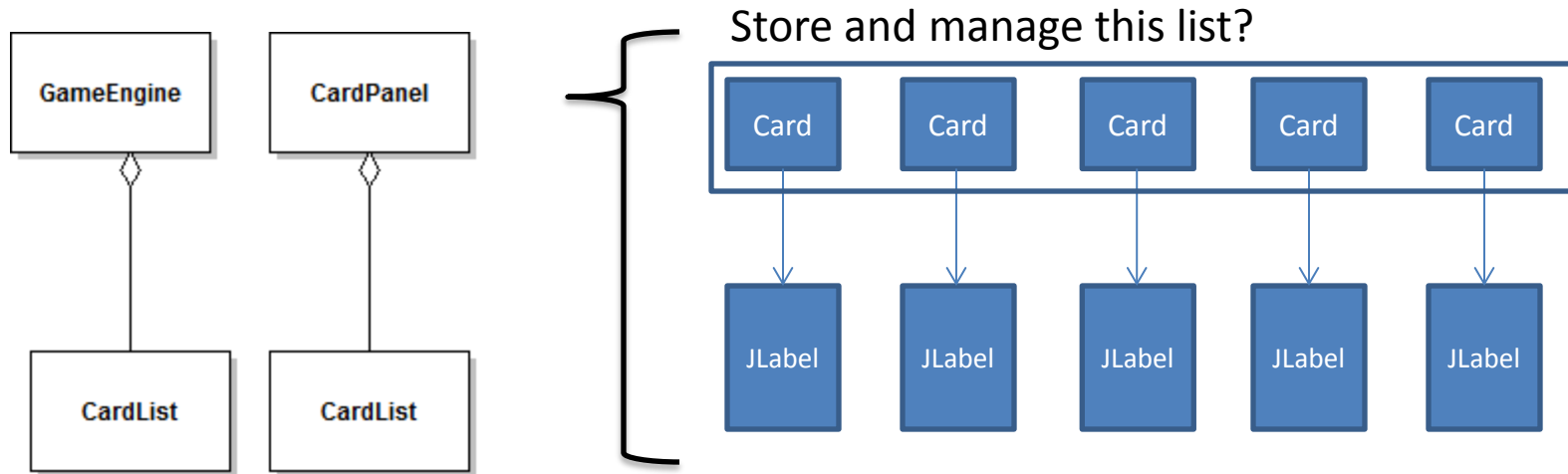
```
public void discard(final Card pCard.  
{
```



A label is selected, which card do we pass?

State Replication

(e.g., between the GameEngine and Components)

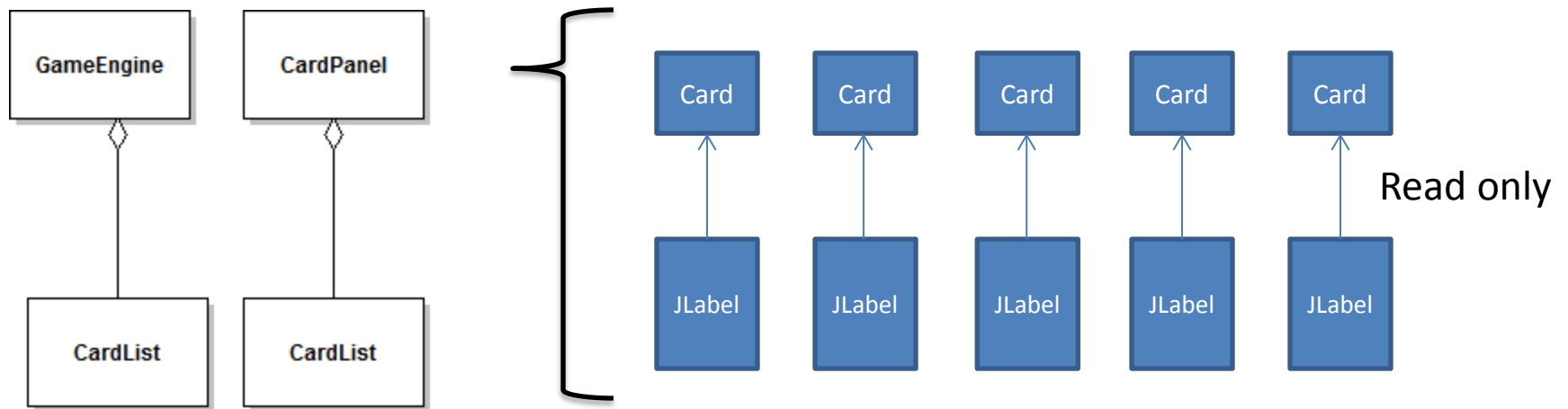


```
/**
 * @return The card that is up. Null if none.
 */
public Card isUp()
{
    for( Component component : getComponents() )
    {
        Boolean constraint = ((OverlapLayout)getLayout()).getConstraints(component);
        if (constraint != null && constraint == OverlapLayout.POP_UP)
        {
            return aCards.get(component);
        }
    }
    return null;
}
```

HashMap generated every
time newHand is called

Do Not Replicate State

(e.g., between the GameEngine and Components)



```
/**
 * @return The card that is up. Null if none.
 */
public Card isUp()
{
    for( Component component : getComponents() )
    {
        Boolean constraint = ((OverlapLayout)getLayout()).getConstraints(component);
        if (constraint != null && constraint == OverlapLayout.POP_UP)
        {
            return aCards.get(component);
        }
    }
    return null;
}
```

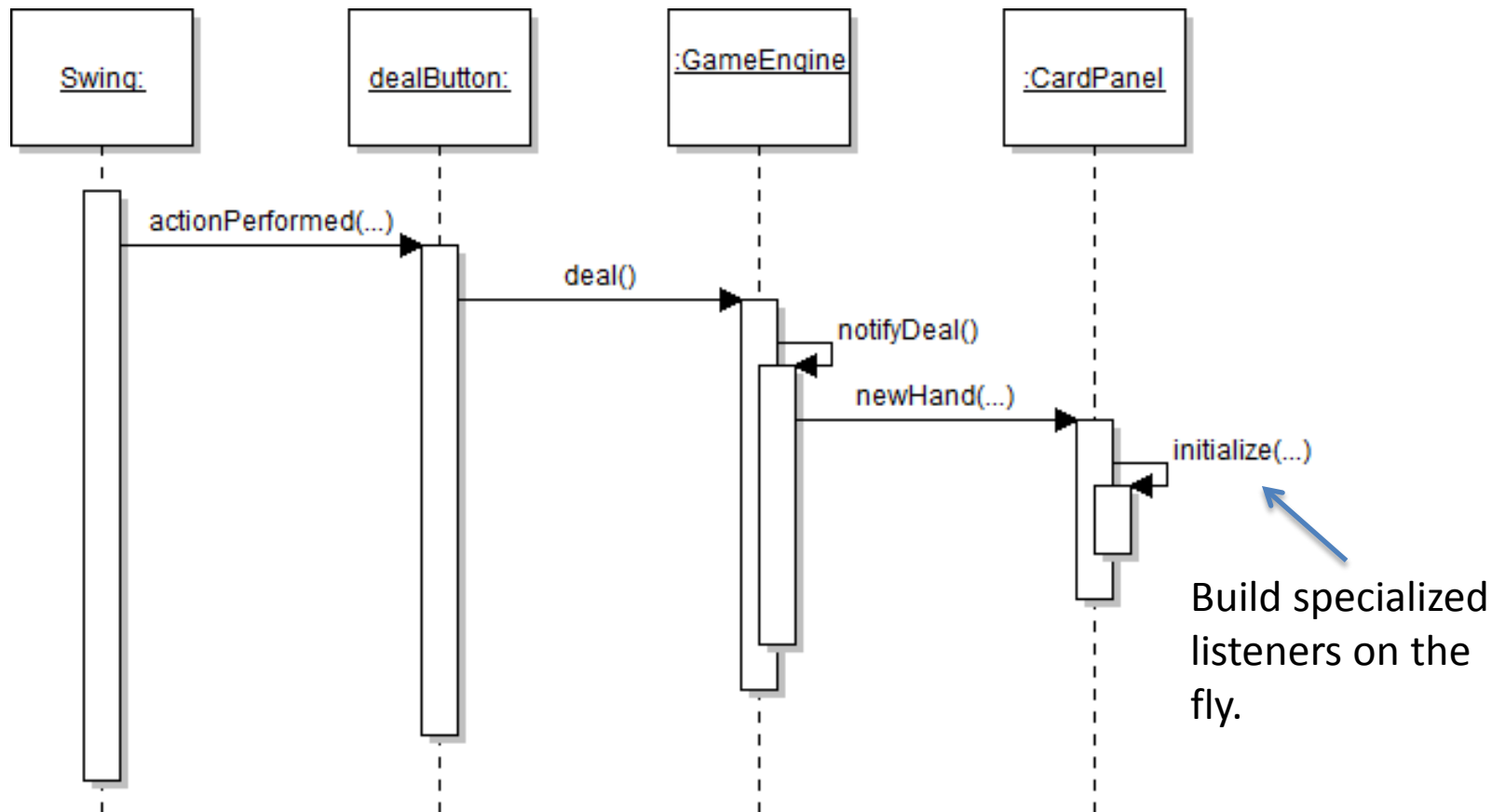
In any case, do not store component state outside the component (e.g., in the GameEngine)

Managing Inter-Component Dependencies

- Instance variables in components (e.g., a reference to the slider in the show panel) introduce inter-class coupling.
- Storing state of interest (e.g., in the model) leads to state duplication. Consistency is hard to manage.
- Accessing the component hierarchy is brittle (changes to the component graph will break the code) and violates the Law of Demeter.

Component Behavior Encapsulation

Encapsulate low-level interactions into components.
Anonymous classes are very useful for this.



Component Encapsulation

```
private void initialize(CardList pCards)
{
    aCards.clear();
    removeAll();
    for( Card card : pCards )
    {
        JLabel lLabel = new JLabel( CardImages.getCard(card));
        aCards.put(lLabel,card);
        lLabel.addMouseListener(new MouseAdapter()
        {
            public void mousePressed(MouseEvent e)
            {
                Component c = e.getComponent();
                Boolean constraint = ((OverlapLayout)getLayout()).getConstraints(c);

                if (constraint == null || constraint == OverlapLayout.POP_DOWN)
                {
                    popAllDown();
                    ((OverlapLayout)getLayout()).addLayoutComponent(c, OverlapLayout.POP_UP);
                }
                else
                {
                    ((OverlapLayout)getLayout()).addLayoutComponent(c, OverlapLayout.POP_DOWN);
                }

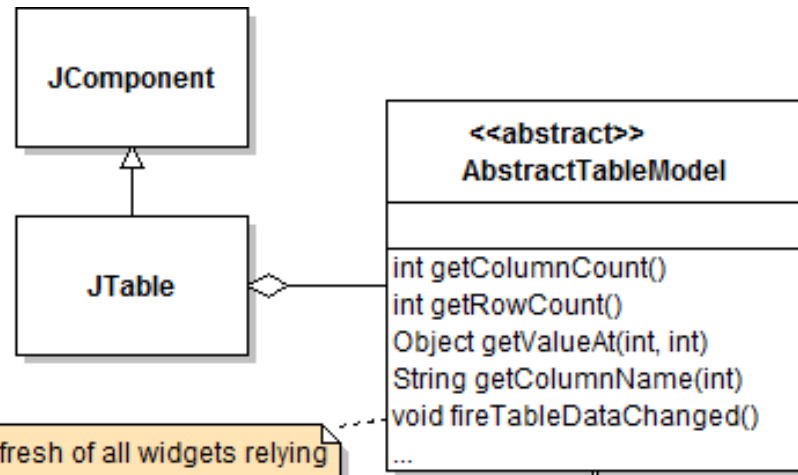
                c.getParent().invalidate();
                c.getParent().validate();
            }
        });
        add(lLabel);
    }
    validate();
    repaint();
}
```

Stateful widgets

Name	Party	Riding	...
Giguère, Alain	NDP	Marc-Aurèle-Fortin	QC
Boulerice, Alexandre	NDP	Rosemont—La Petite-Patrie	QC
Latendresse, Alexandrine	NDP	Louis-Saint-Laurent	QC
Cash, Andrew	NDP	Davenport	ON
Day, Anne-Marie	NDP	Charlesbourg—Haute-Saint-Charles	QC
Quach, Anne Minh-Thu	NDP	Beauharnois—Salaberry	QC
Papillon, Annick	NDP	Québec	QC
Gosal, Bal	Conservative	Bramalea—Gore—Malton	ON
Trottier, Bernard	Conservative	Etobicoke—Lakeshore	ON
Valcourt, Bernard	Conservative	Madawaska—Restigouche	NB
Zimmer, Bob	Conservative	Prince George—Peace River	BC
Butt, Brad	Conservative	Mississauga—Streetsville	ON
Hayes, Bryan	Conservative	Sault Ste. Marie	ON
Borg, Charmaine	NDP	Terrebonne—Blainville	QC
Alexander, Chris	Conservative	Ajax—Pickering	ON
Moore, Christine	NDP	Abitibi—Témiscamingue	QC

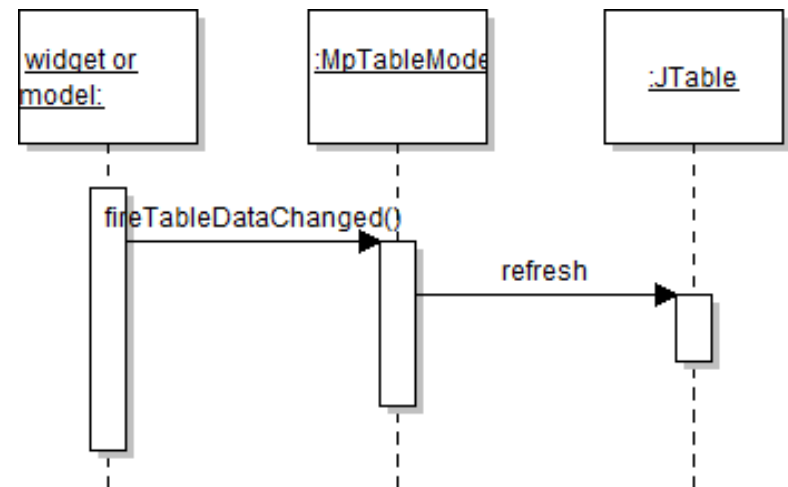
Many stateful widgets (tables, lists...) manage their own data model.

JTable



Triggers a refresh of all widgets relying on this model.

Pulls data out of the Parliament on-demand



Topics in GUI Design

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Illustrative Problem: Timed Interactions

- Some of the interactions will be too fast for players to follow. How can we slow things down?
- First, what not to do.

```
public void discardblocking(final Card pCard)
{
    long start = System.currentTimeMillis();
    while( System.currentTimeMillis() < start + 5000 )
    {
        // do nothing
    }
    removeAll();
    JLabel lLabel = new JLabel( CardImages.getCard(pCard));
    add(lLabel);
    validate();
    repaint();
}
```

Try it...

Package javax.swing Description

Provides a set of "lightweight" (all-Java language) components that, to the maximum degree possible, work the same on all platforms. For a programmer's guide to using these components, see [Creating a GUI with JFC/Swing](#), a trail in *The Java Tutorial*. For other resources, see [Related Documentation](#).

Swing's Threading Policy

In general Swing is not thread safe. All Swing components and related classes, unless otherwise documented, must be accessed on the event dispatching thread.

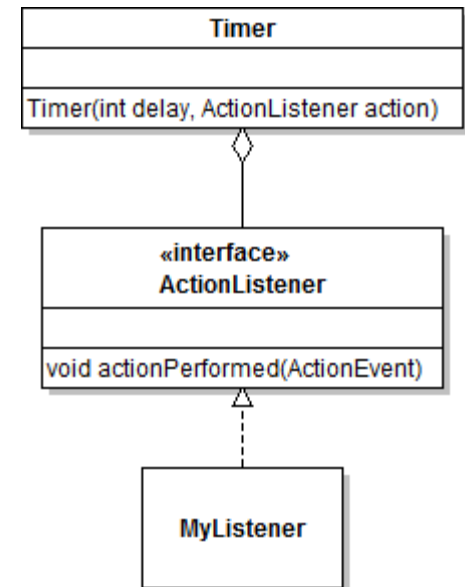
Incorrect Concurrency

```
public void discardThreadAccessViolation(final Card pCard)
{
    new Thread( new Runnable()
    {
        @Override
        public void run()
        {
            long start = System.currentTimeMillis();
            while( System.currentTimeMillis() < start + 2000 )
            {
                // do nothing
            }
            // The calls below call into the Even thread from a different
            // thread, which violates the thread containment policy of swing.
            removeAll();
            JLabel lLabel = new JLabel( CardImages.getCard(pCard));
            add(lLabel);
            validate();
            repaint();
        }
    }).start();
}
```

Use the framework operations!

```
@Override
public void discard(final Card pCard)
{
    // Obtain the speed.
    JSlider lSlider = (JSlider)((JPanel)getParent().getParent().getComponent(1)).getComponent(1);

    new Timer(lSlider.getValue() * 500, new ActionListener()
    {
        @Override
        public void actionPerformed(ActionEvent e)
        {
            removeAll();
            JLabel lLabel = new JLabel( CardImages.getCard(pCard));
            add(lLabel);
            validate();
            repaint();
            ((Timer)e.getSource()).stop();
        }
    }).start();
}
```

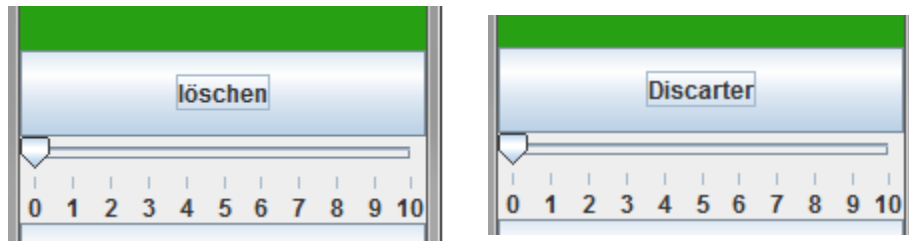


Topics in GUI Design

1. Architecture for your Gin Rummy Application
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Internationalization

A best practice to support easy adaptation of your application to different cultures



Locales and ResourceBundles

- Locale is an object that represents a specific language and/or culture
- **new Locale("fr", "CA")**

```
common.ok=OK
common.cancel=Cancel
common.close=Close
common.error=Error
common.apply=Apply
common.more=More
common.insert=Insert
common.add=Add
common.add.icon=22x22/actions/list-add.png
common.remove=Remove
common.remove.icon=22x22/actions/list-remove.png
common.moveUp=Move Up
common.moveUp.icon=22x22/actions/go-up.png
common.moveDown=Move Down
common.moveDown.icon=22x22/actions/go-down.png
common.clearAll=Clear All
common.clearAll.icon=22x22/actions/edit-clear.png
common.selectAll=Select All
common.selectNone=Select None
```

Accessing a ResourceBundle

```
private static final ResourceBundle MESSAGES =  
ResourceBundle.getBundle("MessageBundle", new Locale("fr"));
```

```
JButton lButton = new  
JButton(MESSAGES.getString("comp303.fivehundred.gui.GameFrame.DiscardButton"));
```

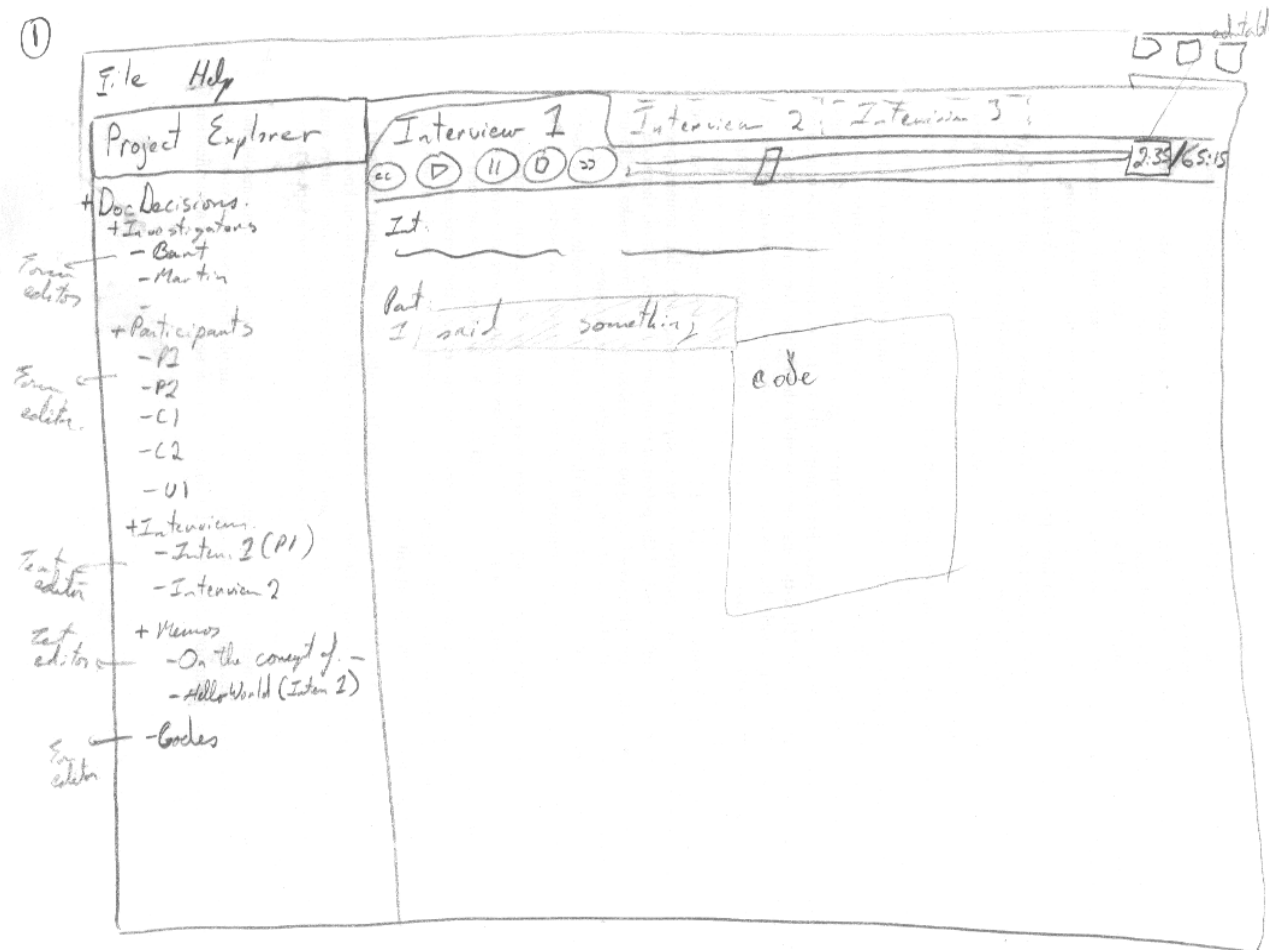
Accessing a Properties Resource

```
private void loadProperties() throws IOException  
{  
    Properties properties = new Properties();  
    properties.load(new FileReader(".properties"));  
}
```

Topics in GUI Design

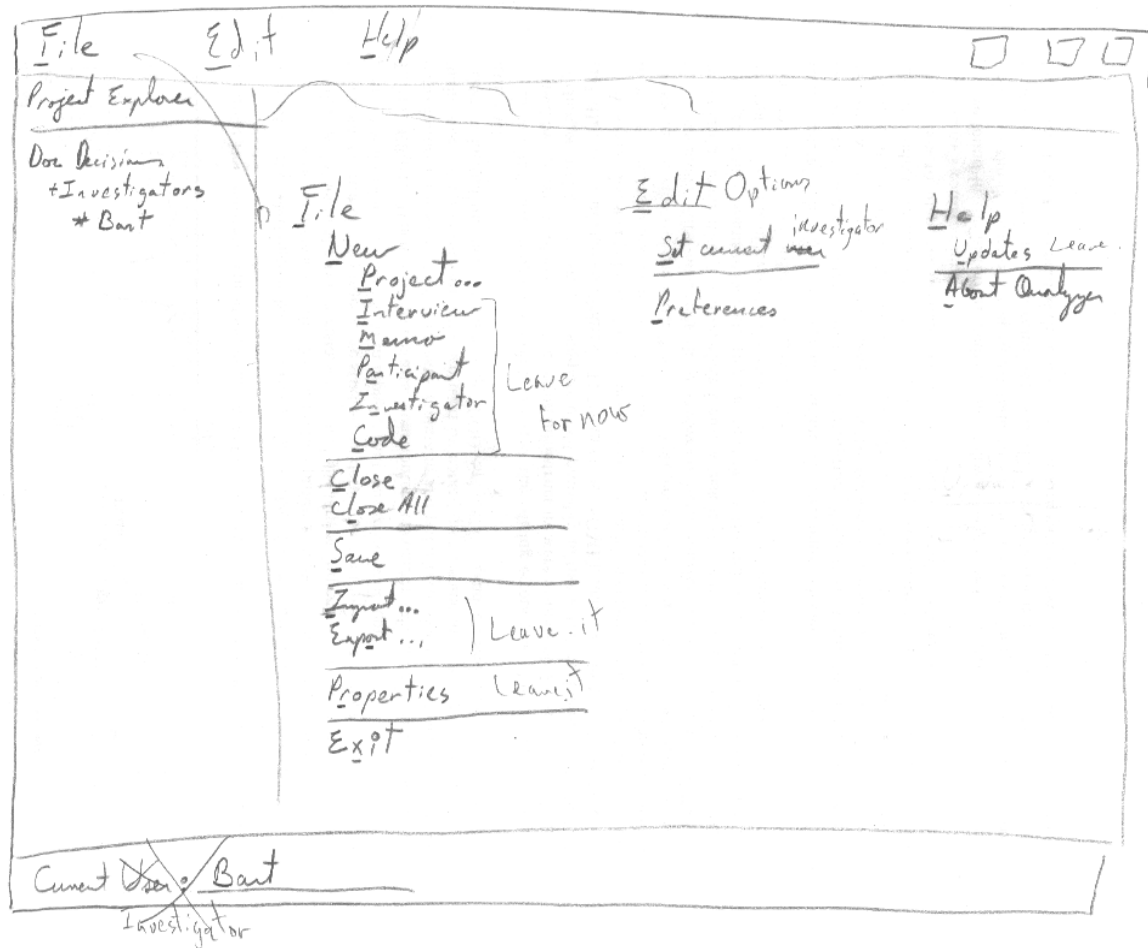
1. Architecture for your Gin Rummy Application
2. Model-View Coupling and Component Encapsulation
3. Thread Containment
4. Resources and Internationalization
5. **GUI “Patterns”**

Qualyzer Mockups



See <http://qualyzer.org> for details

Qualyzer Mockups



Qualyzer Mockups

④ Project Explorer

P2

Participant ID: P2 Participant already exists

Participant Name:

Characteristic

Name	Value	+	-
age	25		

free text/forum

Notes

Interviewing

Inten 1 + - vc can be collapsed

Codes

Code 1 + - Interviewer 2 generated...

double click to open

Gestalt Principles

Proximity

Put things close together, and viewers will associate them with one another. This is the basis for strong grouping of content and controls on a UI.

Similarity

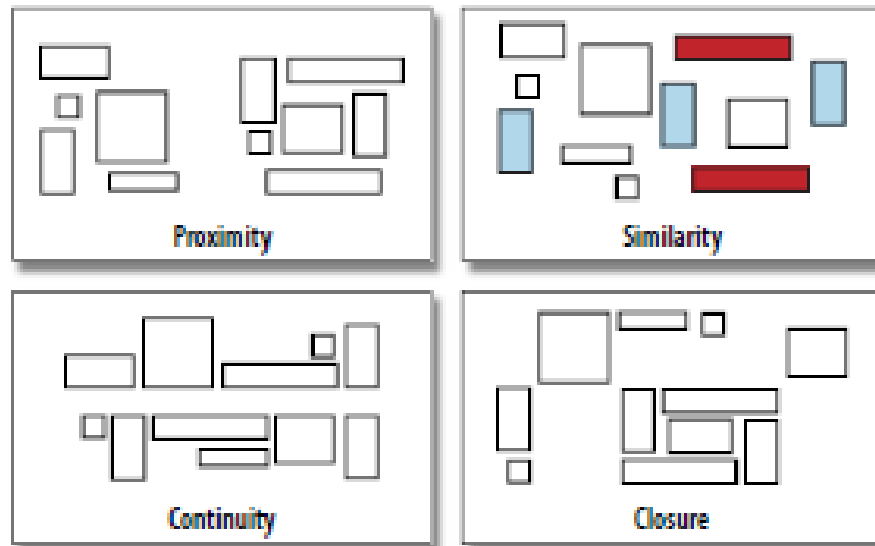
If two things are the same shape, size, color, or orientation, for instance, viewers will also associate them with each other.

Continuity

Our eyes want to see continuous lines and curves formed by the alignment of smaller elements.

Closure

We also want to see simple closed forms, such as rectangles and blobs of whitespace, that aren't explicitly drawn for us. Groups of things often appear to be closed forms.



Center Stage Pattern for Show a single Coherent unit of Information

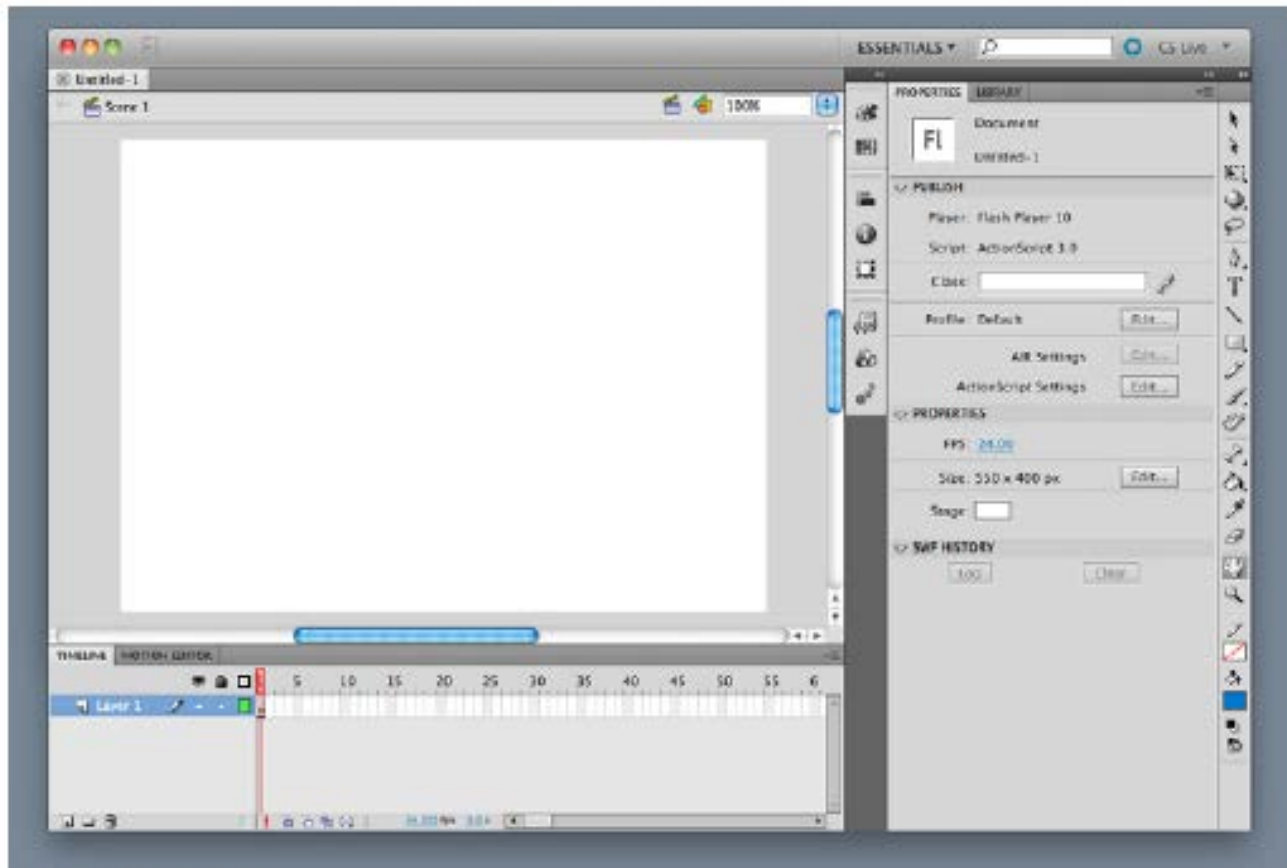


Figure 4-19. *Flash editor*

What

Put the most important part of the UI into the largest subsection of the page or window; cluster secondary tools and content around it in smaller panels.

Titled sections for making dense information easy to scan

Titled Sections

Find your flights

Find your flight below in order to

- Check in online
- Print your boarding pass
- Select or change your seats
- Enjoy Even More Legroom™
- Change or cancel a flight
- View your itinerary

Lets find your flight

Use your TrueBlue account

Log in to quickly retrieve your flight information and manage your flights.

Not a member? [Join our rewards program today.](#)

[Sign in](#)

To manage CompanyBlue flights, [click here](#), login and select "Manage your flight".
To manage Getaways vacation packages, please call 1-800-JETBLUE (538-2553).

OR

Use your confirmation number

Confirmation #

Last Name

[Find my flight details](#)

Where can I find this?

Check the status of a flight

[Check status](#)

[Get flight updates by email](#)


Check in online

You can check in online up to 24 hours in advance, but no less than 90 minutes prior to your flight.

[Get boarding pass](#)

Matrix when the page contains many content items that have similar style and importance, such as news articles, blog posts, products, or subject areas. You want to present the viewer with rich opportunities to preview and select these items.

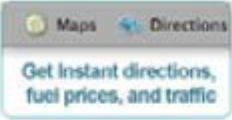
MapQuest Tips, Features, and Partners [Check out the MapQuest Blog »](#)



Evolutionary iPhone App

iPhone users rejoice! Now you can easily save Maps and Routes on MapQuest.com and retrieve on your iPhone.


- [Get the App now!](#)



Try Our New Toolbar

Add MapQuest to your browser and enjoy anytime access to Maps, Directions, Traffic, Gas Prices & more.


- [Get The Toolbar](#)



Your Location...Found!

Now you can easily plot your approximate location on a MapQuest map utilizing a WIFI connection, wherever you are!


- [Get The Toolbar](#)



MapQuest Route Planner

Give us a trip with up to 25 stops and we'll give you the fastest and shortest route.

- [Try It Now!](#)



MapQuest Customers

See how top brands utilize the MapQuest Platform to power their location needs.

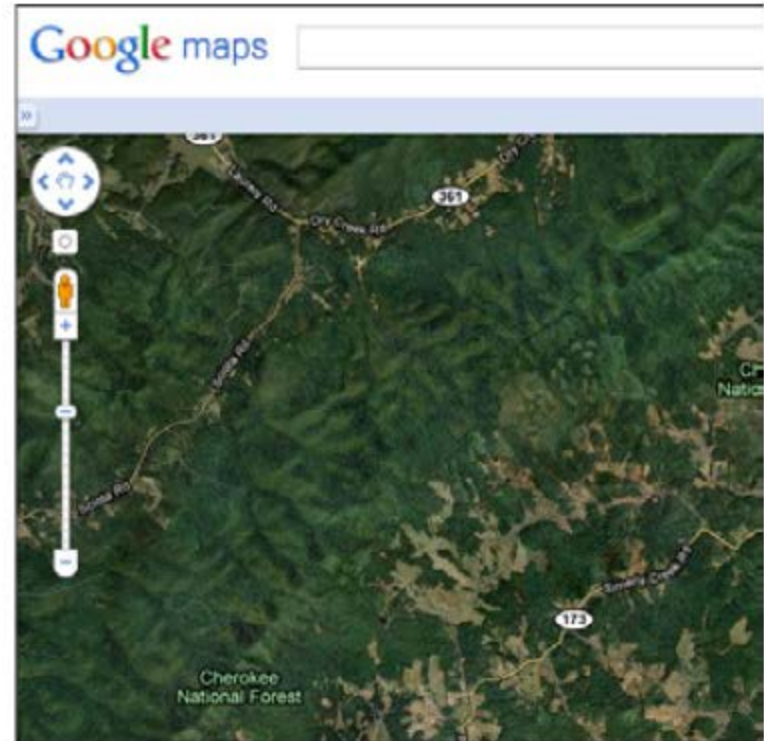
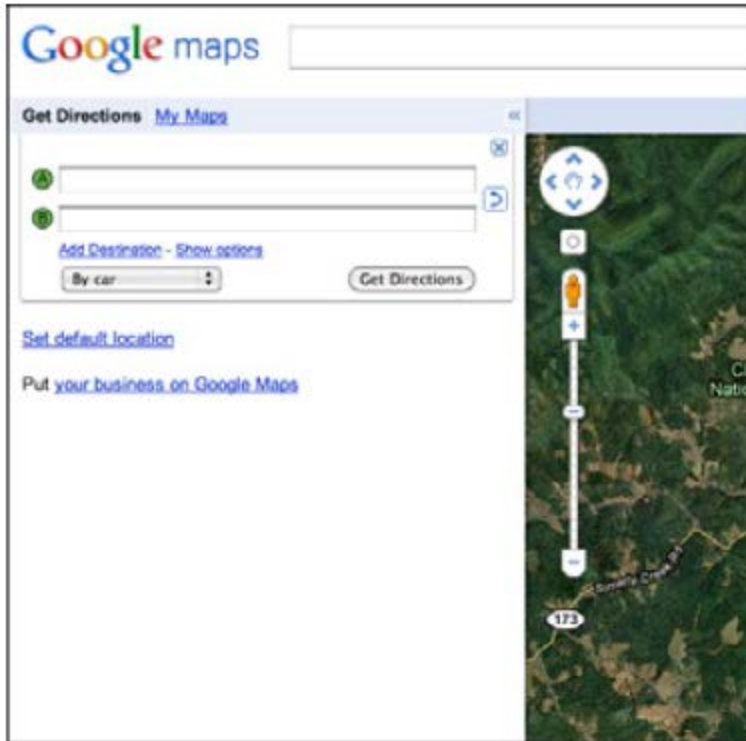
- [Business Solutions](#)
- [See Enterprise Site](#)

Module tabs: Use when you have a lot of heterogeneous content to show on the page, possibly including text blocks, lists, buttons, form controls, or images. You don't have room for everything.

The image shows a web interface with three module tabs at the top: "Maps", "Directions", and "What's New". The "Maps" tab is active. Below the tabs, there is a search section with the following elements:

- Get a Map**: A green link.
- Find a Business (optional)**: A link with an airplane icon and a magnifying glass icon.
- International:** A dropdown menu currently showing "US & Canada".
- Your Recent Locations**: A section with a "Clear All" link and a help icon.
- Search Input**: A text box containing the placeholder text "e.g., Best Western or Hotel".
- Buttons**: A "Saved & Recent" button with a dropdown arrow, and a "Get Map" button.
- Form Fields**: A large text box for "Address or Intersection", and three smaller text boxes for "City", "State", and "Zip Code".
- Link**: A link labeled "Use Copy and Paste Forms" with a small icon.

Collapsible Panels



For information that's only relevant a small fraction of the time

Movable Panels

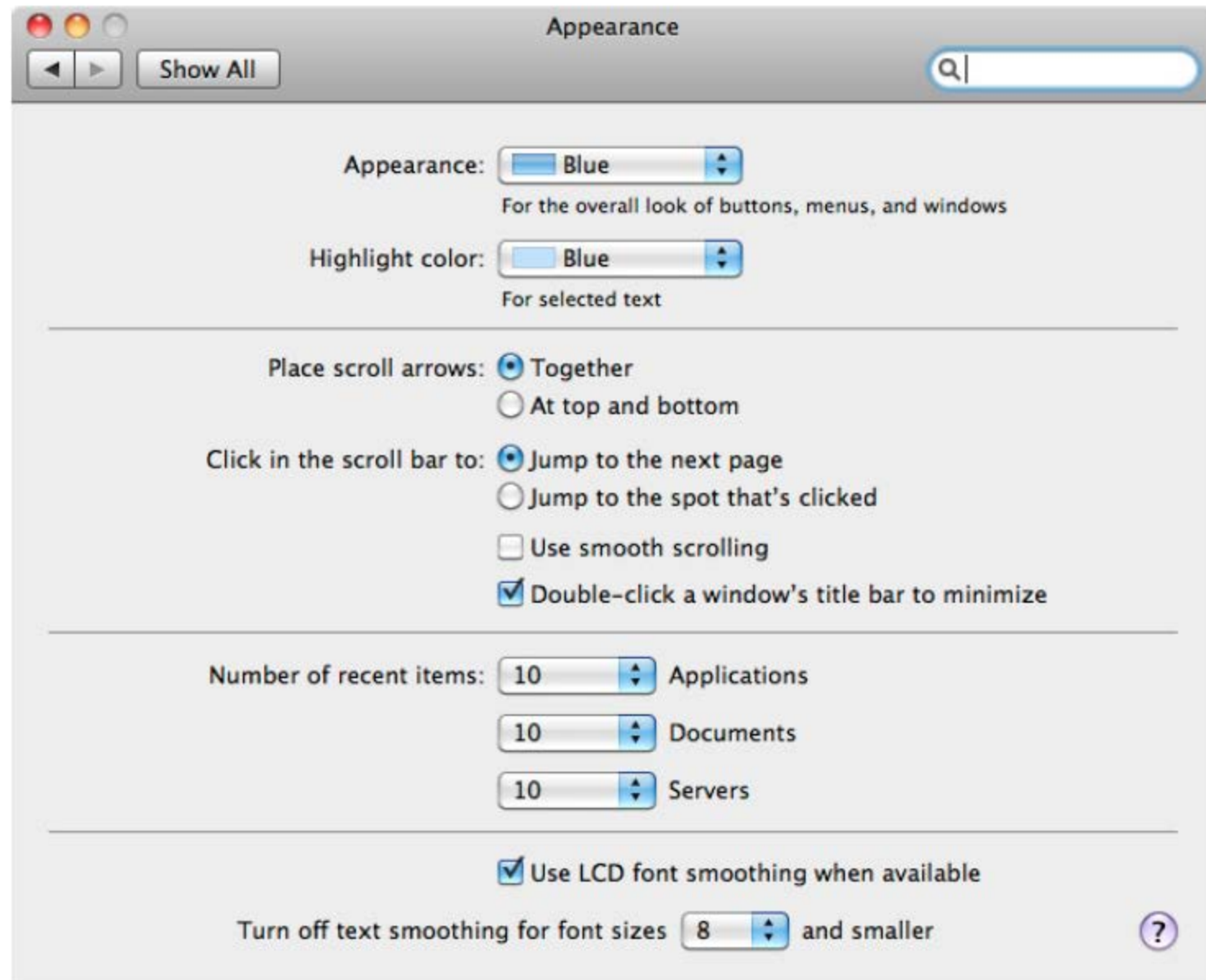
The screenshot displays the Yahoo! homepage with a blue header and a sidebar on the left. The main content area is filled with various panels that can be moved, as indicated by the 'Options' button in the top right corner of each panel. The panels include:

- Quicklinks:** A vertical list of icons and links for Answers, Autos, Finance, Games, Groups, HotJobs, Local, Mail, Maps, Mobile Web, Movies, Music, OMG, Personals, Real Estate, Shine, Shopping, Sports, TV, and Travel.
- Yahoo! Mail Preview:** A panel showing the user's email status.
- Weather:** A panel for Arlington, MA, showing a current temperature of 73°F with light rain. It includes a forecast for Today (80° / 68°), Tomorrow (80° / 68°), and Friday (82° / 74°). A 'Severe weather alert' is also present.
- Top Stories:** A panel with tabs for Featured, World, Local, and Finance. It lists several news items, including a BP work freeze in the Gulf, retail sales drop, and alleged 'Barefoot Bandit' charges.
- Stock Portfolios:** A panel showing the user's stock portfolio, 'My First Portfolio', with a table of symbols, prices, and changes.
- Local News - Boston Herald:** A panel with a list of local news items, including a juvenile lockup review and a theater head indictment.
- Local News - Boston Globe:** A panel with a list of local news items, including a validation of perspiration and a rescued turtle.
- The New York Review of Books:** A panel featuring a book review of 'Petraeus's Baby' by Ahmed Rashid.
- Note to Self:** A panel with a note about scheduling a P/T conference.

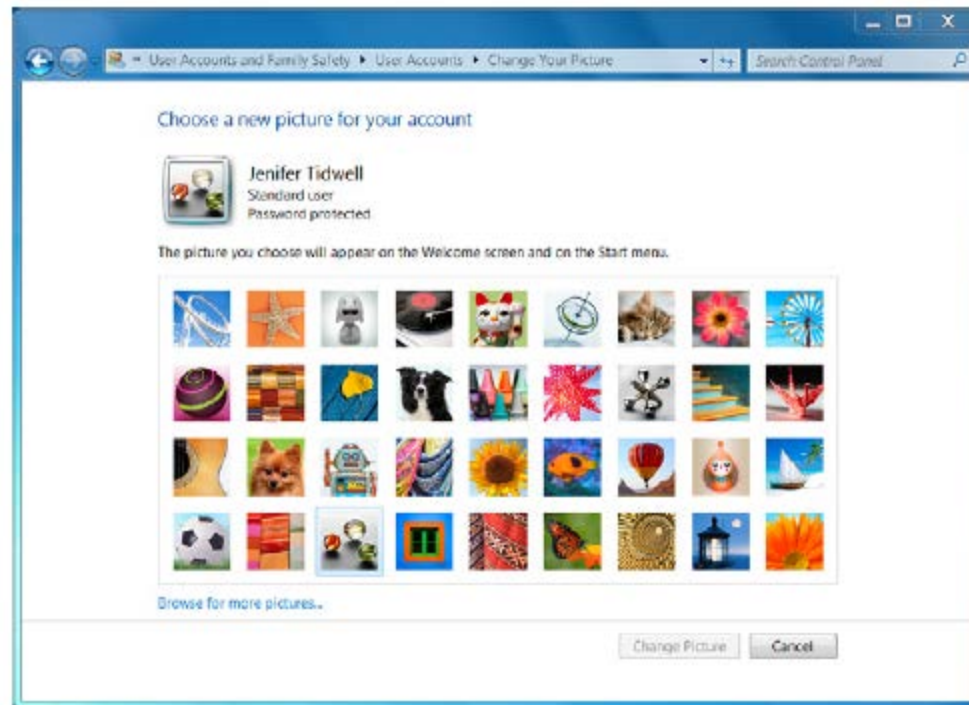
The interface is designed to be highly customizable, allowing users to rearrange and resize these panels to suit their needs.

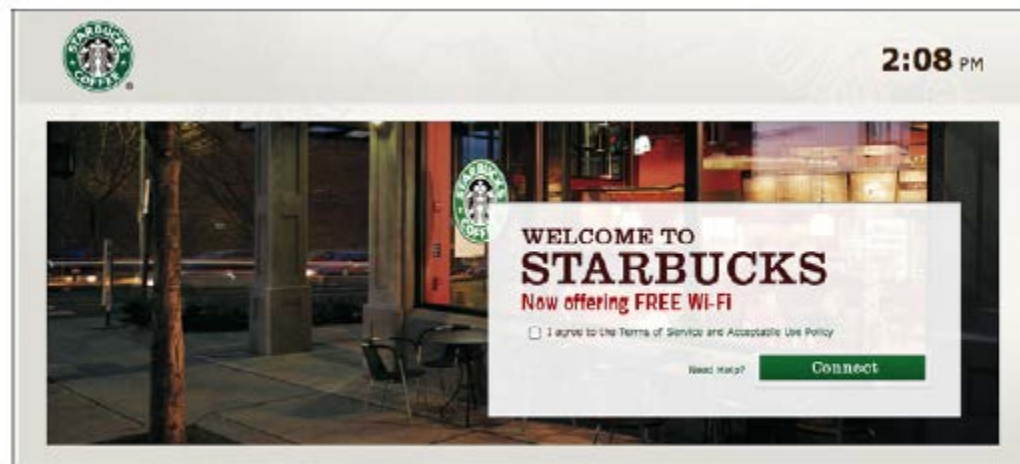
Not allowed for the project!

Right/Left Alignment



Diagonal Balance





Responsive Enabling

TurboTax 2009 IRA Calculator
How much can you contribute to an IRA and what's the tax impact?

Your Personal Information
Marital Status: ☐ Single ☒ Married
Eligible to participate in a retirement plan at work? ☐ Yes ☒ No
Age on Dec. 31, 2009:

Enter Your Income
Your Earnings:
Other Taxable Income:

Choose Your Contribution
You can contribute up to a MAXIMUM of \$0 combined to a Traditional and Roth IRA.
Traditional IRA: ☐ Don't Qualify
Roth IRA: ☐ Don't Qualify

TurboTax 2009 IRA Calculator
How much can you contribute to an IRA and what's the tax impact?

Your Personal Information
Marital Status: ☐ Single ☒ Married
Eligible to participate in a retirement plan at work? ☐ Yes ☒ No
Age on Dec. 31, 2009:

Enter Your Income
Your Earnings:
Other Taxable Income:

Choose Your Contribution
You can contribute up to a MAXIMUM of \$5000 combined to a Traditional and Roth IRA.
Traditional IRA: ☐ Don't Qualify
Roth IRA: ☐ Don't Qualify