



the  
**POWER**  
of  
**JAVA™**



# Client Processing Models

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# Goals:

Explore models for client side processing evolving on the Web.

-> Challenges faced by developers

Note the benefits and drawbacks of various methods to gain a balanced understanding of the options.

# Agenda

## Processing models

### Smart Client Architecture

- Component Library
- Processing/behavior environment and controller
- Data services & Code Demo
- Connectivity to local or remote resources.
- Flexibility for extension

### Composite Client Applications

- Reference Model

### Q & A

# Agenda

## Processing models

### Smart Client Architecture

- Component Library
- Processing/behavior environment and controller
- Data services
- Connectivity to local or remote resources.
- Flexibility for extension

### Composite Client Applications

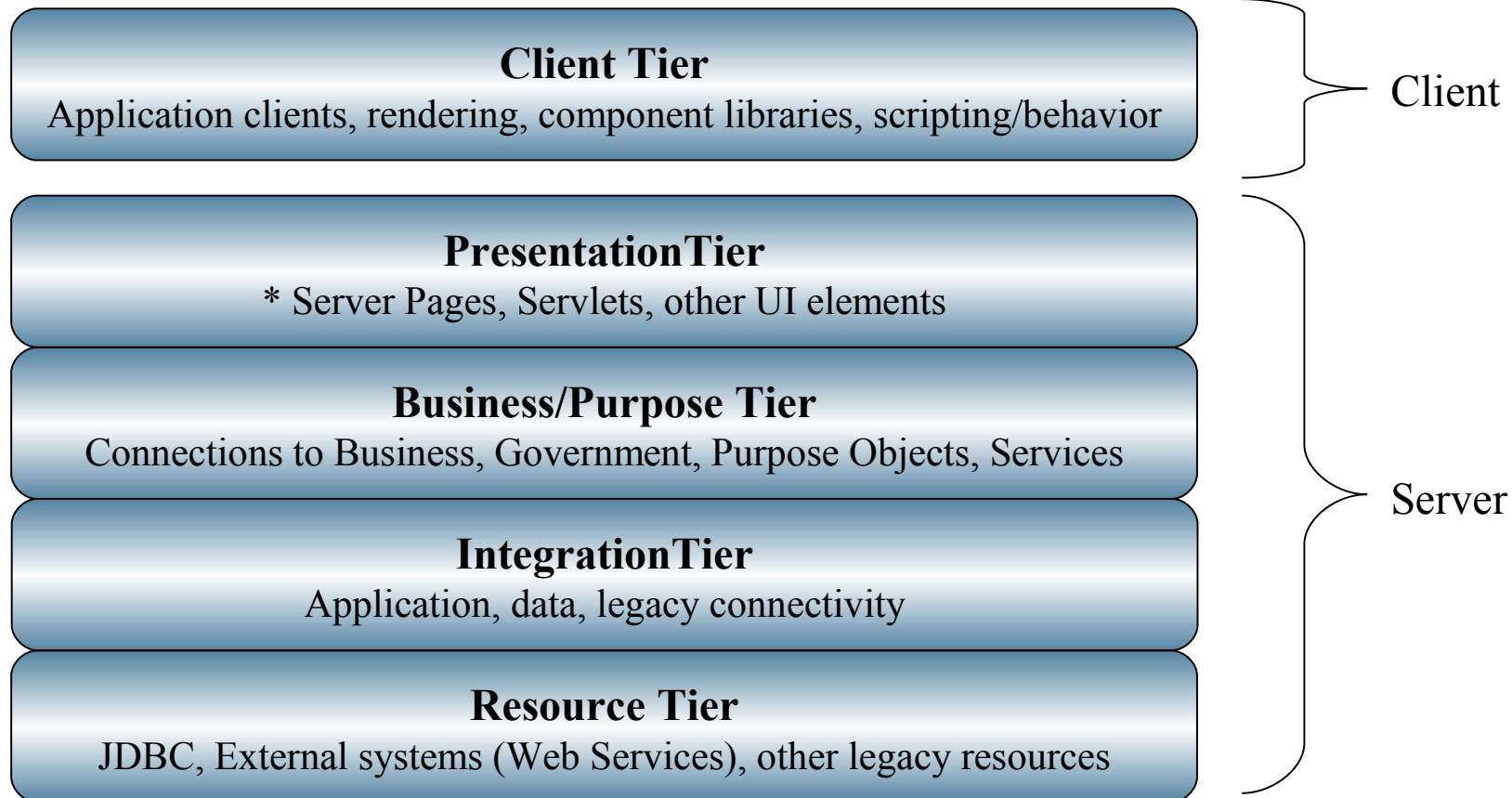
- Reference Model

Q & A

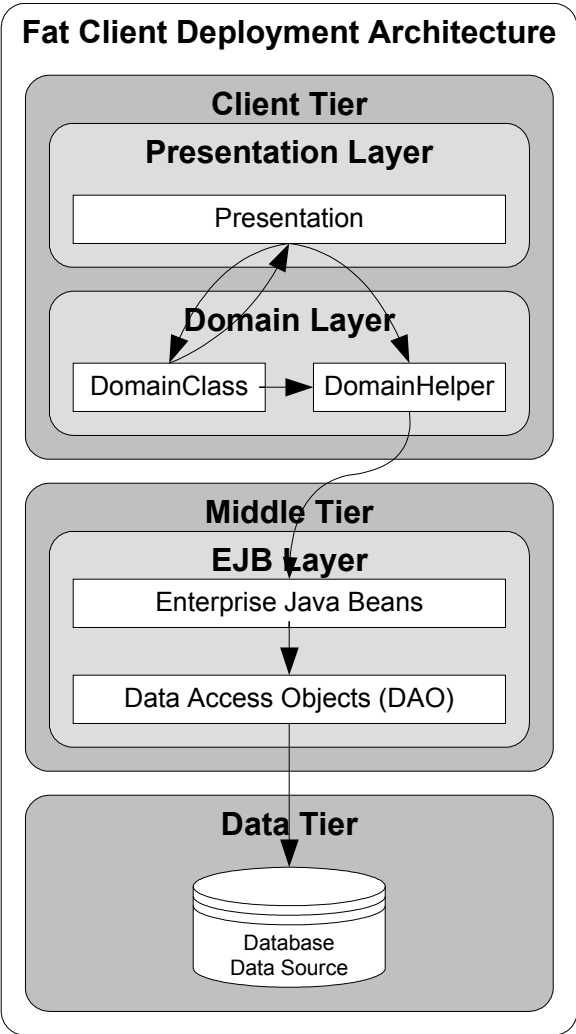
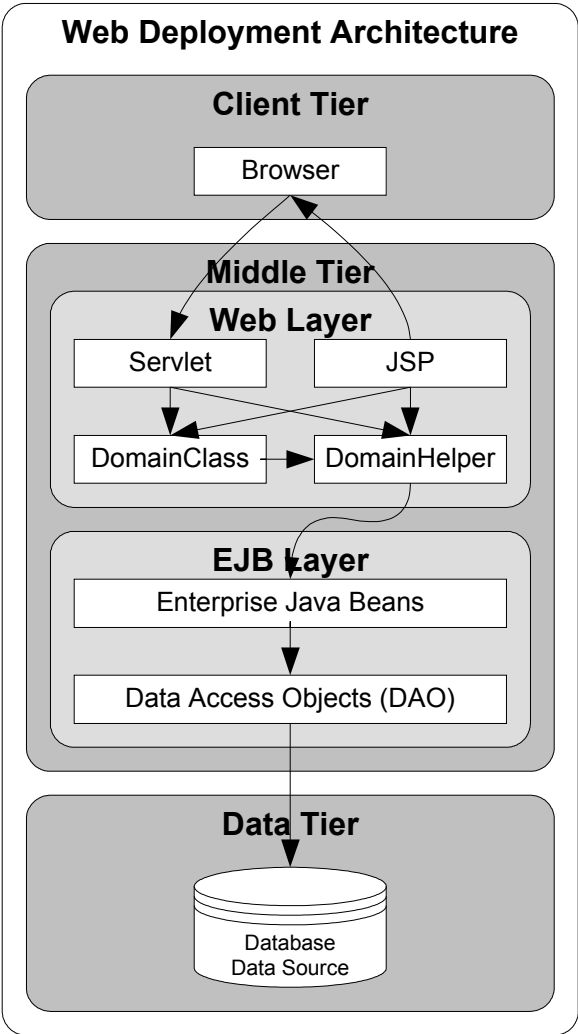
# Buzzword Bingo...

- **Smart client** – something better than what exists today.
- **Composite client** – a client that can aggregate and interact with resources from various sources in various protocols/presentation capabilities.
- **Web 2.0** - a general term to describe what people will do on the internet in years to come.

# Client Server model



# Java CS models.



# Processing on the client

## Areas of concern

- Manipulation of data
- Manipulation of view/presentation
- Processing functionality, sandbox
- Connectivity variations
- Creating RIA's, rich user experiences (formats)
- Targeting multiple platforms
- Security
- More...

Source: Please add the source of your data here



# Variations...

- **Thin Client** – minimal client capabilities
- **Rich client** – maximum processing offloaded onto client.
- **Composite client** – one client uses local, remote resources and multiple areas of processing.
- **NEW! Smart client** – evolving as a model based on what some think “*Web 2.0*” is.

# Client Side Data Manipulation

- Security Environment
  - Interactions ONLY with data to which the user is authorized
  - Trade off -> More security = less capability and vice-versa
- Data Accessor Methods
  - Persistent Data on the client does not change
  - Read only access but not to restricted data (address books etc)
- Data Mutator Methods
  - Client Side Data that the client can change
  - Effective “Sandbox” (micro DB) for persisting data on client
  - Example: Cookie DB
  - Concerns over access to hard drive

# Online interruptions and fixes

- Going Offline
  - Decide what data/logic are required by client
  - Synchronizing changes when onlineStatus = "1"
- Caching
  - Long term / Short term
  - Data expiration and constraints
  - Security risks
- Design for all models:
  - Always -Network connection essential
  - Mostly -Infrequently disconnected
  - Sometimes -Disconnected for significant amount of time
  - Intermittent -Connectivity nice to have and/or expensive
  - Offline -Explicitly offline

# Client Side Processing

- Access restricted to processes “owned” by client
  - Interactions to client system resources limited
  - Many exploitation points (buffer overflow, API calls, plug in exploitation...)
- Can be interrupted when online connectivity ceases
  - AJAXians keep trying
  - Examples: Offline form completion
- Requires delicate care for 2PC’s, ACID and other transaction models.

# Agenda

Processing models

## Smart Client Architecture

- **Component Library**
- **Processing/behavior environment and controller**
- **Data services**
- **Connectivity to local or remote resources.**
- **Flexibility for extension**

Composite Client Applications

- Reference Model

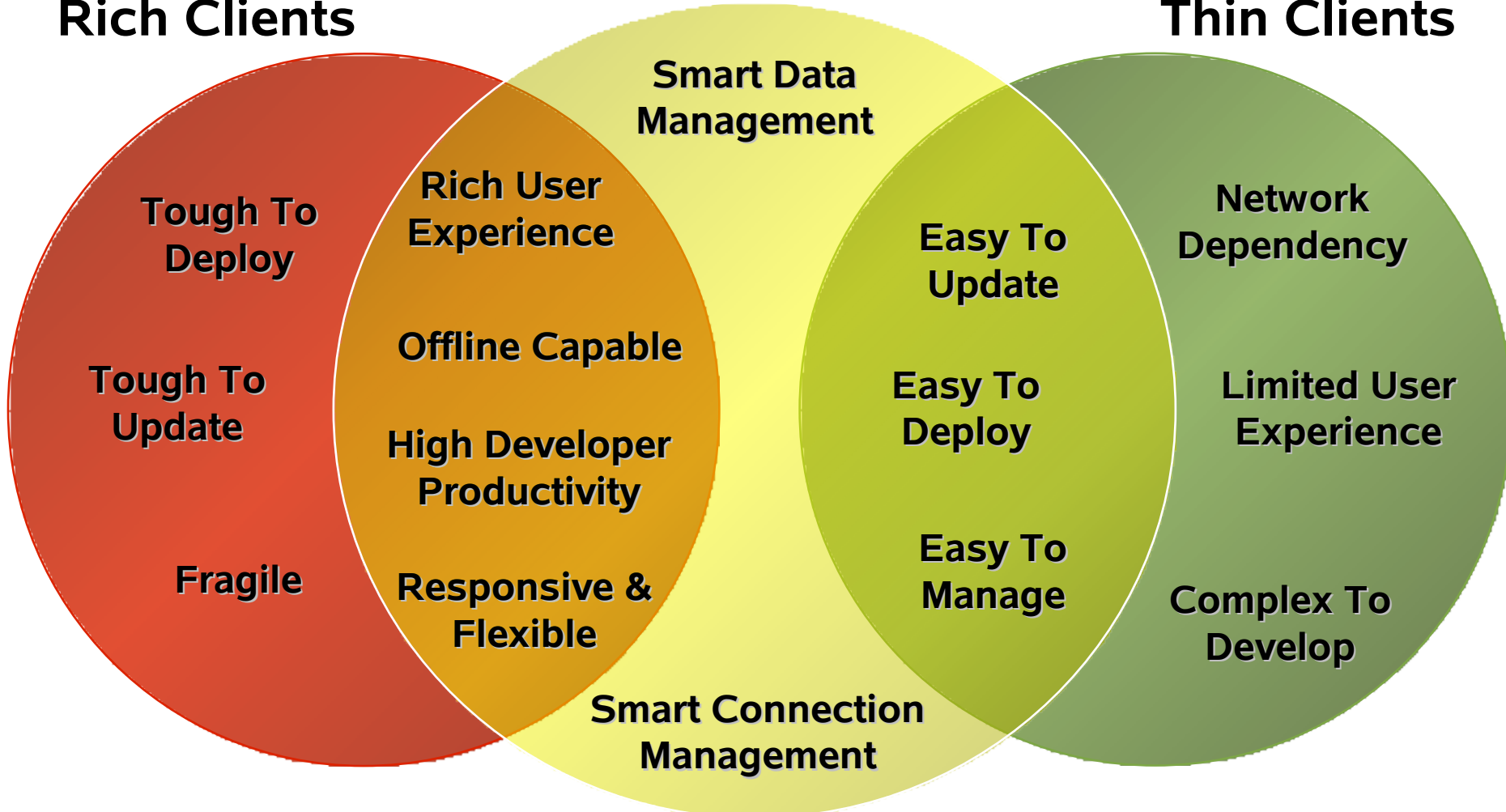
Q & A

# Smart Client?

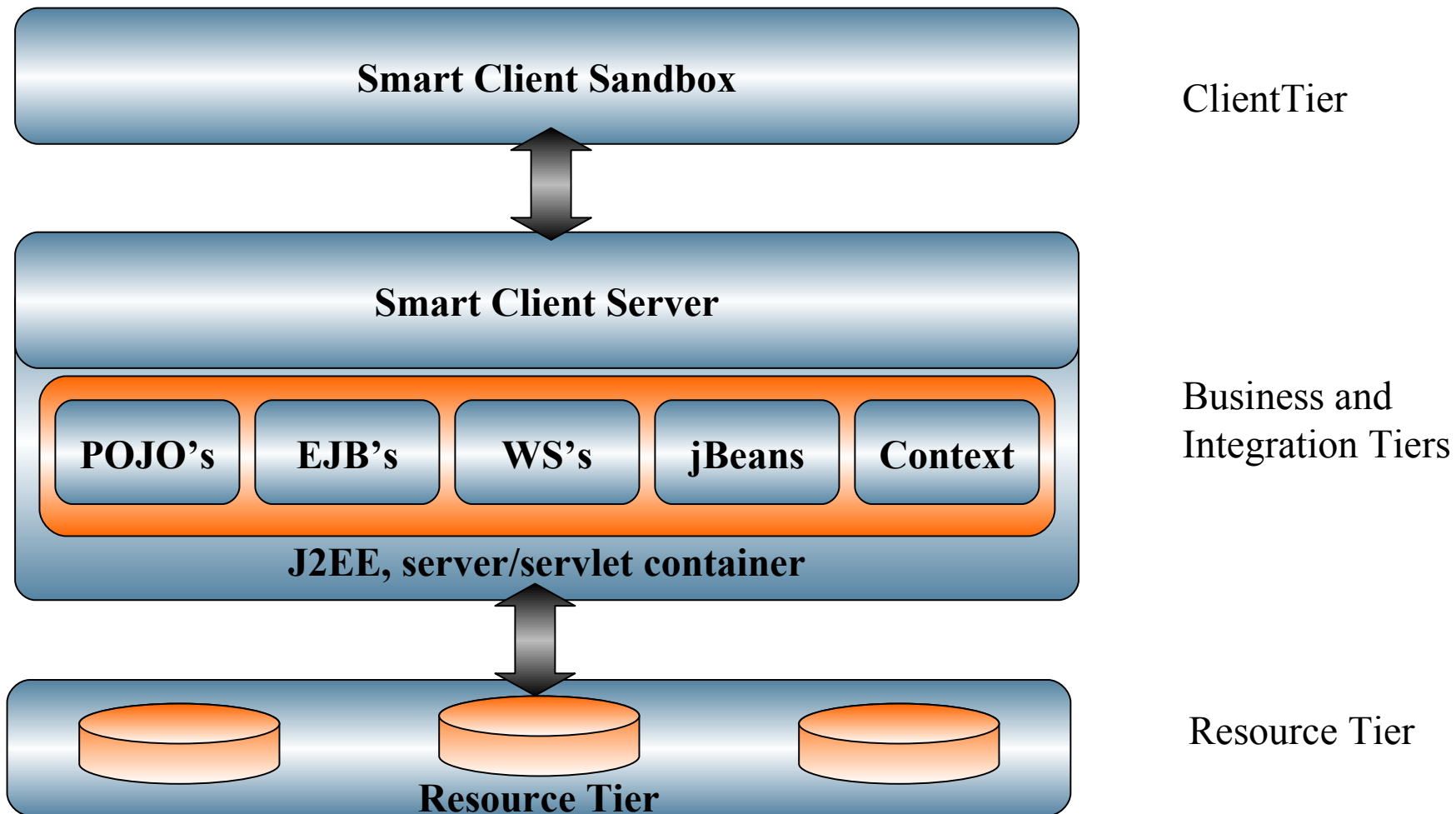
## Rich Clients

## Smart Clients

## Thin Clients



# Smart Client Model

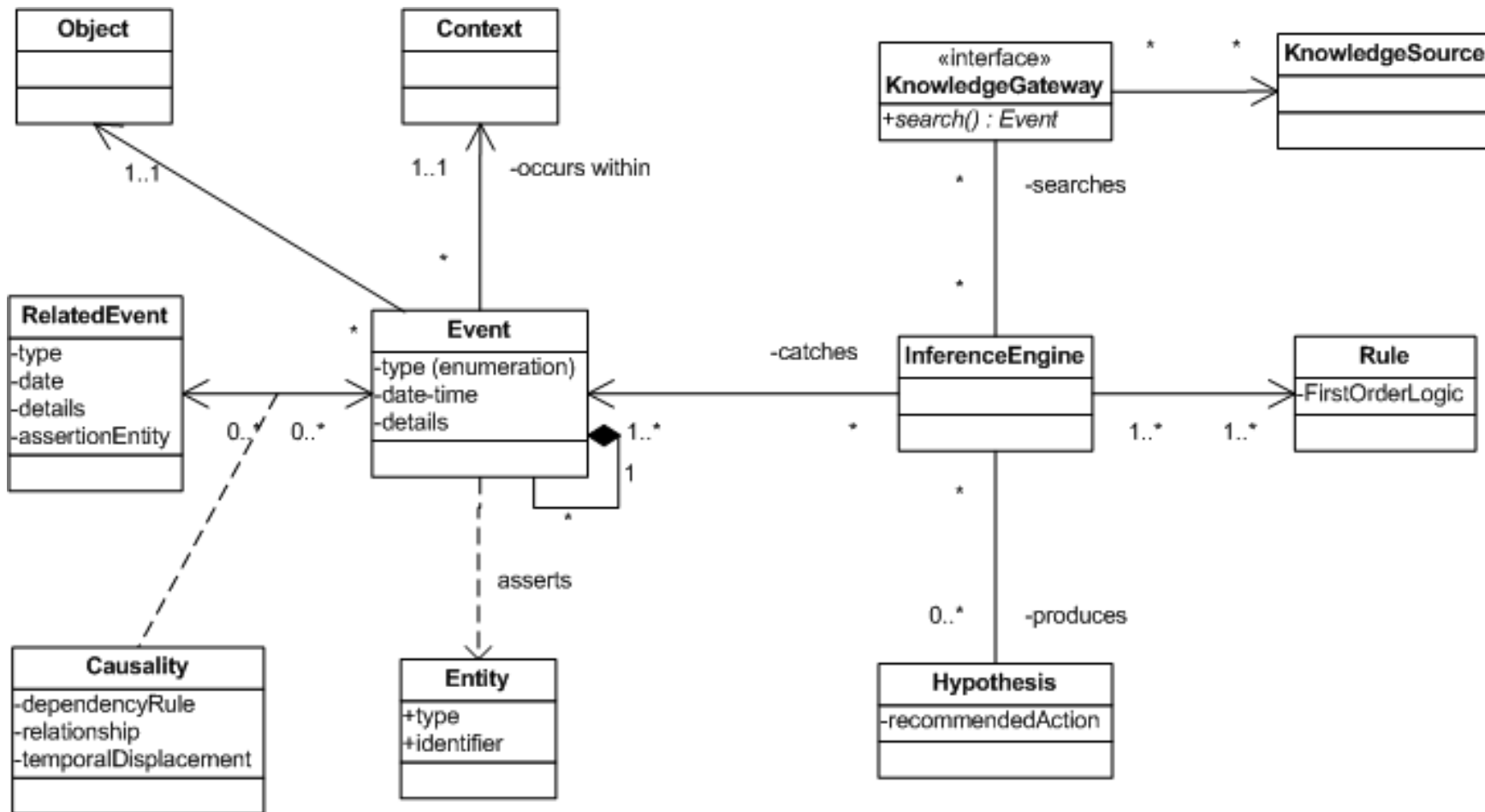


# What does Smart Client need?

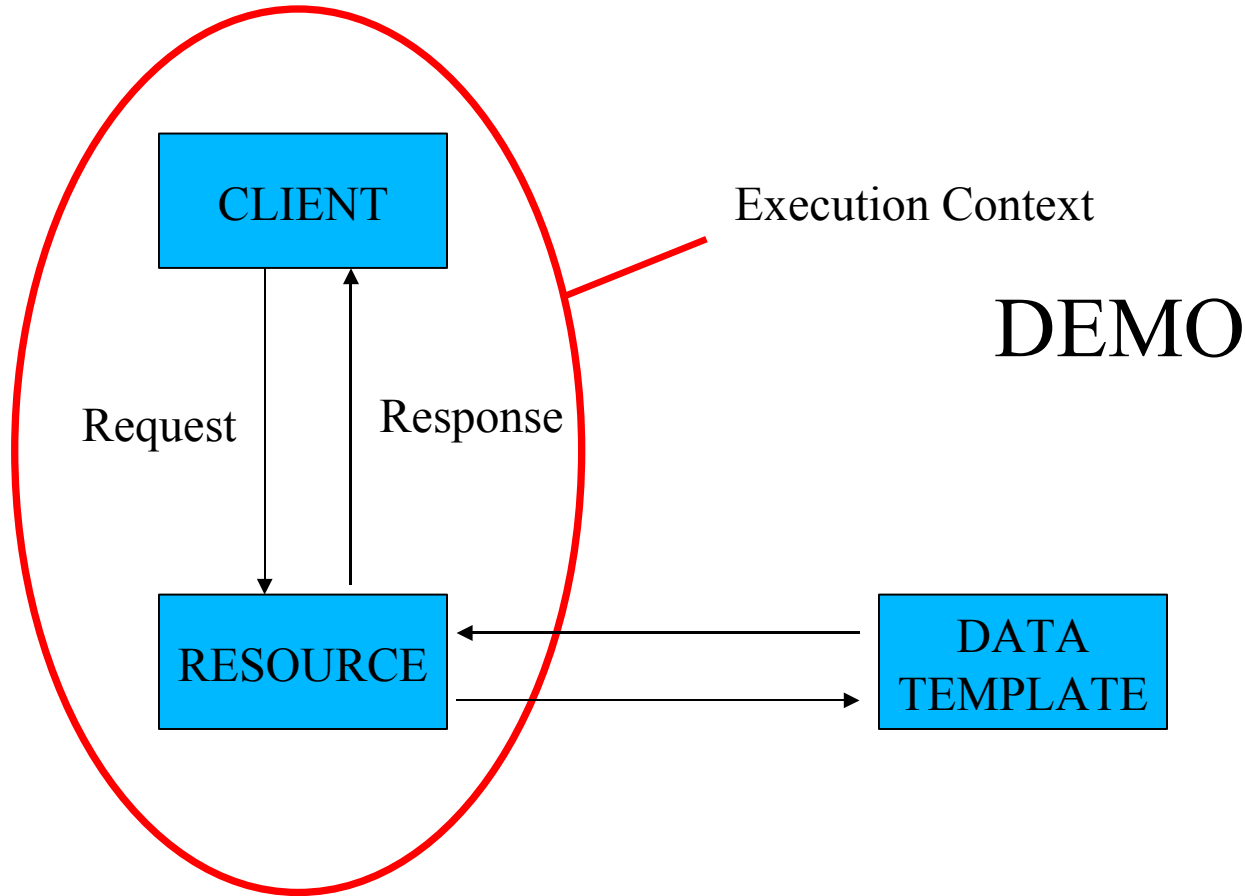
- Component Library
- Processing/behavior environment and controller
- Data services
- Connectivity to local or remote resources (Beans, servlets, PJO's etc..)
- Presentation (RIA)
- Flexibility for extension, updating, self configuring...
- Contextual configuration



# Context?



# Context-Specialist Pattern



# Requirements for developers

- Standard architecture models
  - SOA, MVC
- Standard programming models
  - Client side scripting model (ECMAScript, JavaScript, ActionScript et al.)
  - Client/server side program execution (Java beans, POJO's)
  - OOP methodologies
  - J2EE on server
- Standards for connectivity on the wire
  - Web Services

# Smart Client Component Library

- Availability of multiple libraries:
  - HTML components
  - XForms, PDF Forms, et al
  - Flash, Flex components
  - Java Swing components
  - AJAX widgets
  - ...
- Developers can opt for best of class for each component
- Smart client layout should include ability to mix panes of different components

# Processing and control

- Generally with lightweight scripting languages
  - ECMAScript, JavaScript, ActionScript
  - Common approach to processing (event based)
  - Java can be used too ( n-tier architecture).
  - Bridge the scripting languages to use your classes.
- Enforce consistent use of OOP techniques where possible.
  - Lexically scoped variables
  - Accessor/mutator for class members
- Ease of interaction to bind data (local or remote) to presentation components.
  - Registering eventListeners on objects

# W3C DOM Event Model

- Triggers are events.
- Standard event model
  - Focus(), blur(), click(), mouseOver(), ...
  - Timer based, user initiated, server initiated...
  - <http://www.w3.org/TR/DOM-Level-2-Events/events.html>
- Event listeners – detection
- doSomething() – correlation between events and actions.
- Events have targets and source objects.
- Can be abused – example: (onBlur(focus()));

# Event handling example

```
//create a new empty object
myobject = new Object();
//now register our interest in the Mouse objects
broadcast
Mouse.addListener(myobject);
//define the onMouseMove event handler for our
object
myobject.onMouseMove = function() {
trace("Mouse was moved");
};
//now register our interest in the Key objects
broadcast
Key.addListener(myobject);
//define the onKeyDown event handler for our object
myobject.onKeyDown = function() {
trace("Key was pressed");
};
```

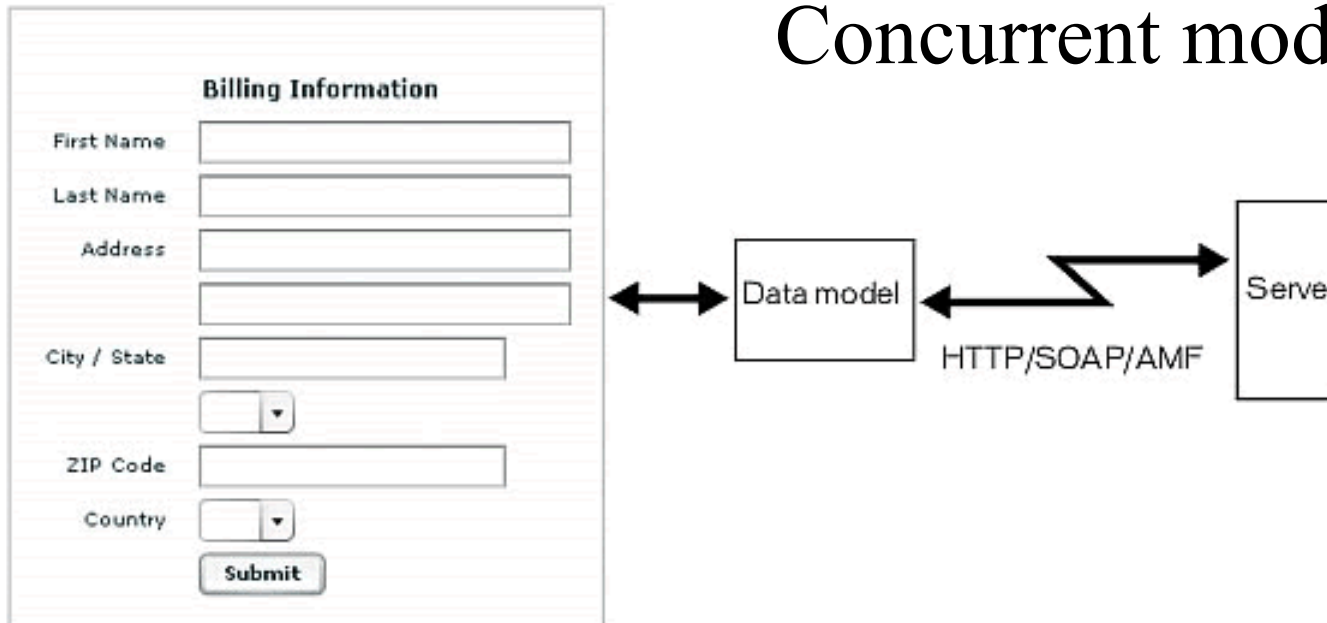
# Data Services

- Access to local and remote data
- Consistent security model
- Authorization and audit capabilities
- Client side sandbox
- Requires a new model for persistent DRM
- Semantics and Structure



# Data synchronization

- Easy if 1:1
- More difficult in 1:\* to manage  
Concurrent modifications.



# Concurrency

- Most business process span transactions. One transaction is used to read the data and display it to the user, and another transaction is used to update the persistent store with the user's modifications.
- Concurrency issues can crop up on client too based on a client offerings services as well as consuming them.

# Connectivity

- Calling web services over various protocols
  - HTTP, UDP
- Reliable messaging
- Asynchronous and Synchronous models
- P2P, server calls, RPC, pull or push, eventing...
- Other key concepts
  - Idempotent
  - Security sessions, trust
  - Conflict resolution

# Presentation components

- Clean separation from M/C
  - Skins
- Timeline/state based models possible
- Binding point between creative professionals and developers

# Keys to design/dev workflow goals

- Separate out code into “code behind” pages
  - Use `<Script source="xxx">` or other methods to separate the control from container.
  - Designer: Build presentation components, then add events and handlers.
  - Developer: Build cool app then build GUI.
  - They think differently!
- Do as much styling in CSS as possible
- Designers and Developer should understand each others technologies as much as possible.

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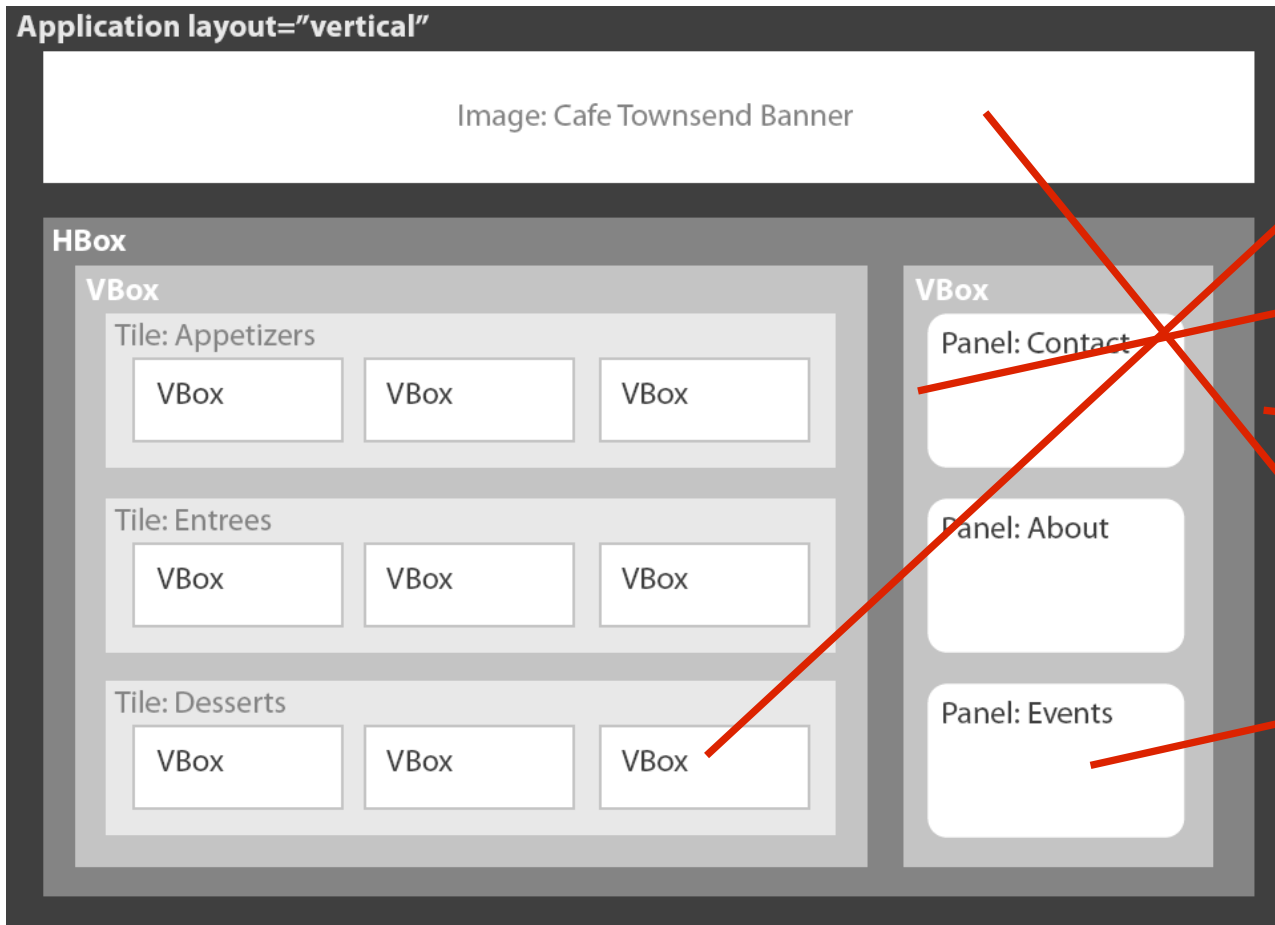
### Composite Client Applications

- Reference Model

Q & A

# Composite Client Example

And interactions between all...



AJAX lookup

Java Swing

HTML container

Flash

PDF doc

**café TOWNSEND**  
Nouveau World Cuisine

**Appetizers**

- Roasted Tomato Soup**  
Served with goat cheese croutons
- Summer Salad**  
Organic butter lettuce with apples.
- Fondue of Brie, Goat Cheese, and Gruyere**

**Entrées**

- Pancetta-wrapped Sea Scallops**  
Drizzled with tarragon puree.
- Cajun Seafood Bouillabaisse**  
With crawfish, scallops, catfish.
- Cavatappi Pasta with Spicy Chickpea Sauce**

**Desserts**

- Chocolate Mouse Granita**  
Served in a martini glass with a
- Baked Pears with Caramel Sauce**  
Topped with house-made vanilla-
- Pumpkin Creme Brulee**  
Served with our famous ainder

**How to Find Us**  
We are easy to find. If you are taking public transportation, we are 2 blocks south of the bullet train stop. Located across from the famous gigantic galaxy structure.

**About Cafe Townsend**  
Café Townsend's visionary chef and founder leads the way in a culinary revolution. Praised by many to be the best chef in the world today, Chef Ipsum blends earthy seasonal flavors and bold ingredients to create exquisite contemporary cuisine.  
The name Café Townsend comes from our first restaurant, located in a historic building on Townsend Street in San Francisco, where we opened the doors in 1992. We've replicated the elegant interior, exceptional service, and world class cuisine in our restaurants around the country.

**Take a Closer Look**  
Our private dining room provides a warm, intimate setting for your event. We can accommodate 60 seated guests for dinner or up to 100 guests for a standing reception.

AJAX lookup

Java Swing

HTML (container)

Flash

PDF doc



# Composite client

- Blurs lines between software, client interactions with a server, P2P etc.
- Composed of multiple pieces of functionality in some form of container.
  - Example: imagine XL\* built of Flex, Ajax, Swing components rendered in a browser with a multi user security model.
  - **DEMO:** <http://labs.ebusiness-apps.com/wiki/default.asp?EBASpreadsheetSneakPeak>

\* A hypothetical name for a spreadsheet like program that may be made by a large software company.

# AJAX Spreadsheets....

EBA Spreadsheet - Microsoft Internet Explorer

File Edit View Favorites Tools Help Google Search

Back Forward Stop Home Search Favorites Refresh Print Mail Wordpad

Address <http://labs.ebusiness-apps.com/technologies/spreadsheet/default.asp>

	A	B	C	D	G
1				Uncoated	Publication
2	Mills	Country	Newsprint	Paper	Paper
3					
4	Europe				
5	Norske Skog Skogn	Norway	580		
6	Norske Skog Saugbrugs	Norway	550		
7	Norske Skog Follum	Norway	130	165	
8	Norske Skog Union	Norway	165	85	
9	Norske Skog Golbey	France	600		
10	Norske Skog Bruck	Austria	120	255	
11	Norske Skog Steti	Czech Republic	125		
12	Norske Skog Walsum	Germany	435		
13	Norske Skog Parenco	The Netherlands	320	155	
14	Total Europe		3025	=d5+d6+d.	0
15					
16	Australasia				

http://192.168.168.102/Checkout/EBASpreadsheet/v10/Test/Common/Properties/sample.asp - Microsoft Internet Explorer

File Edit View Favorites Tools Help Google Search PageRank Options

Back Forward Stop Home Search Favorites Refresh Print Mail Print Preview Print Setup

Address http://192.168.168.102/Checkout/EBASpreadsheet/v10/Test/Common/Properties/sample.asp

	A	B	C	D	E	
1	*****		This is another test			
2	Bulk Purchase Depreciation Calculator					
3		00/01/2001				
7	Gray cells will be calculated for you. You do not need to enter anything in them.					
8	ASSETS	This is a test				Book val
9	Current					
10	Cash					
11	Accounts receivable					
12	Inventory					
13	Total					44500
14	Property, plant, and equipment					
15	Land					
16	Building					
17	Building improvements					

Microsoft Internet Explorer - Bulk Purchase Depreciation Calculator

Address: https://.../.../...

File Edit View Insert Format Tools Data Window Help

1 \*\*\*\*\*

2 Bulk Purchase Depreciation Calculator

3 [Date]

4

5 PURCHASE 250000

6

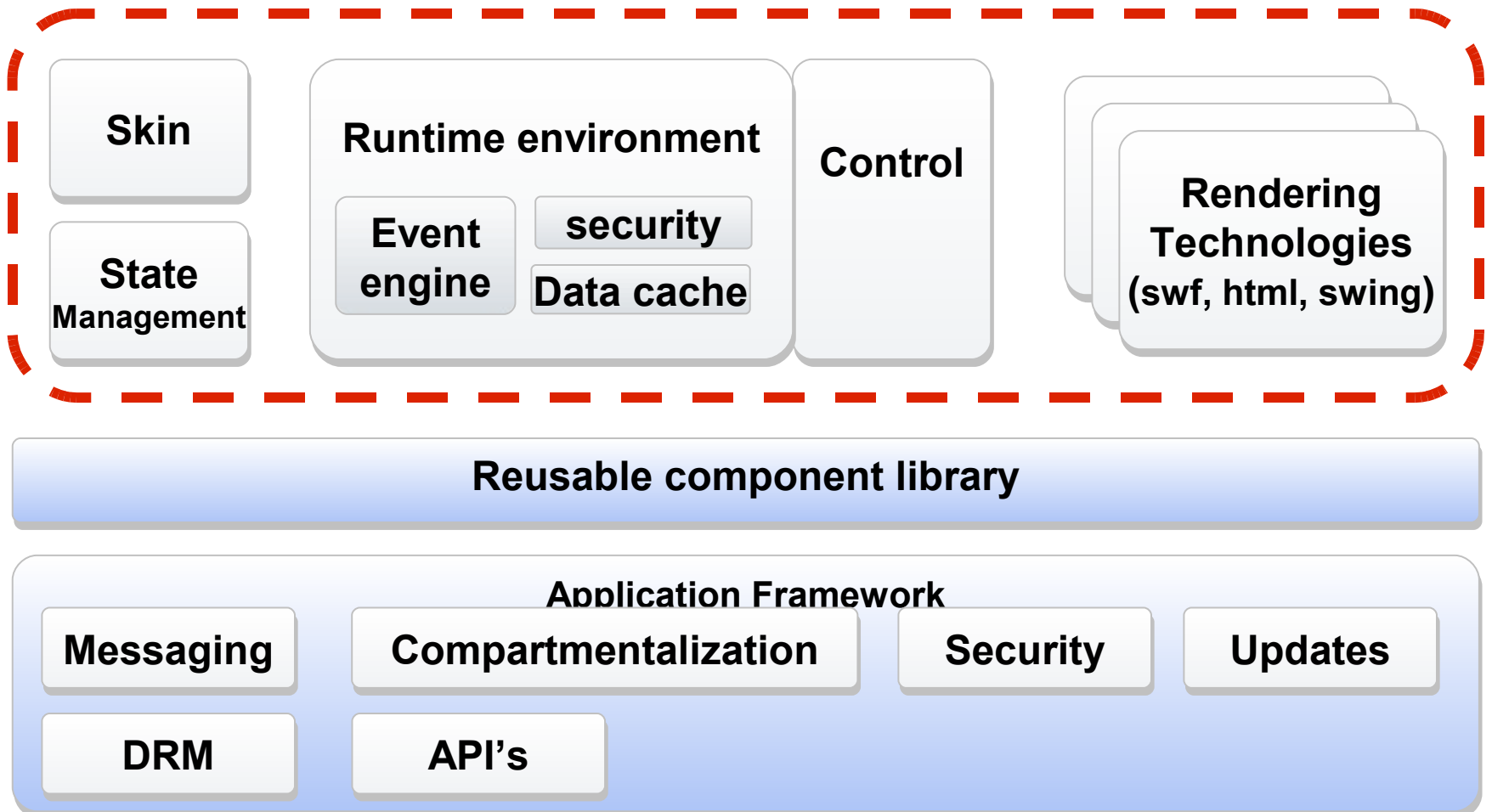
7 Day rolls will be calculated for you. You do not need to enter anything in them

8

ASSETS					Book value SELLER	Fair market VALUE	Book value BUYER
9	Current						
10	Cash					500	500
11	Accounts receivable					20000	18000
12	Inventory					24000	26000
13	Total				44500	44500	44500
14	Property, plant, and equipment						
15	Land					20000	40000
16	Building					150000	175000
17	Building improvements					50000	30000
18	Computers and office equipment					3000	2500
19	Furniture and fixtures					5000	3000
20	Machinery					25000	10000
21	Vehicles					25000	10000
22	Total				278000	270500	270500
23	Intangibles						
24	Goodwill						55000

8 [Company Name] CONFIDENTIAL

# Composite client model



# A perspective...



# A perspective...



# Summary

- Programming models are stable
  - Supporting technologies still changing
- Smart client is evolution
- Too many creative people building the future to stay where we are.
  - Web 2.0 (whatever that really means)
- Clients are servers too.
- Interested to hear your thoughts.



# Q&A

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# Thank you

## Java on the Client – processing models

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