

# Services, Frameworks, and Components

## What is really important to quality rapid application development?

H. James Hoover  
Software Engineering Research Lab  
Department of Computing Science  
University of Alberta  
[hoover@cs.ualberta.ca](mailto:hoover@cs.ualberta.ca)  
<http://www.cs.ualberta.ca/~softeng>  
<http://www.avrasoft.com>

IBM CASCON 1998  
Workshop on Component-based software composition  
Thursday Dec 3

Research supported by NSERC and Teledyne Fluid Systems

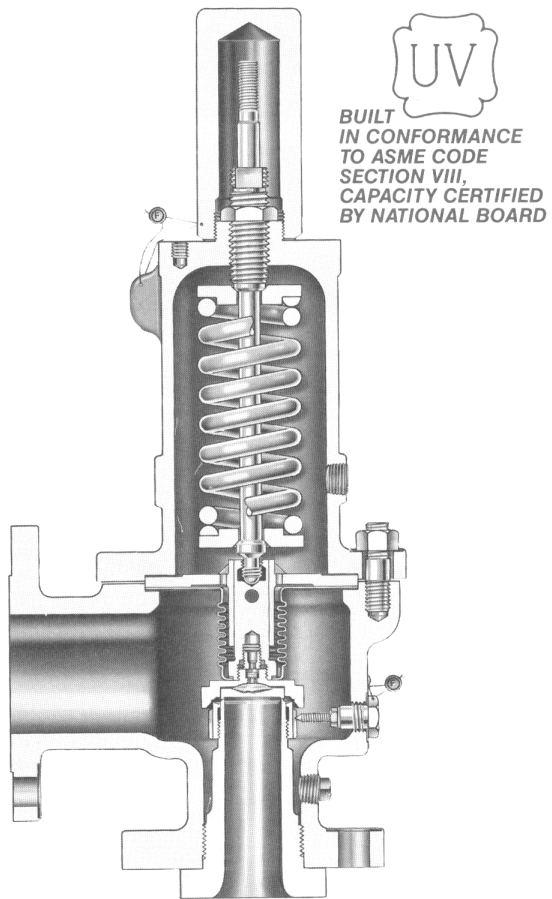
# Outline

- The story of SizeMaster
- Services, Components, and Frameworks
- A slogan
- RAD issues
- Conclusion

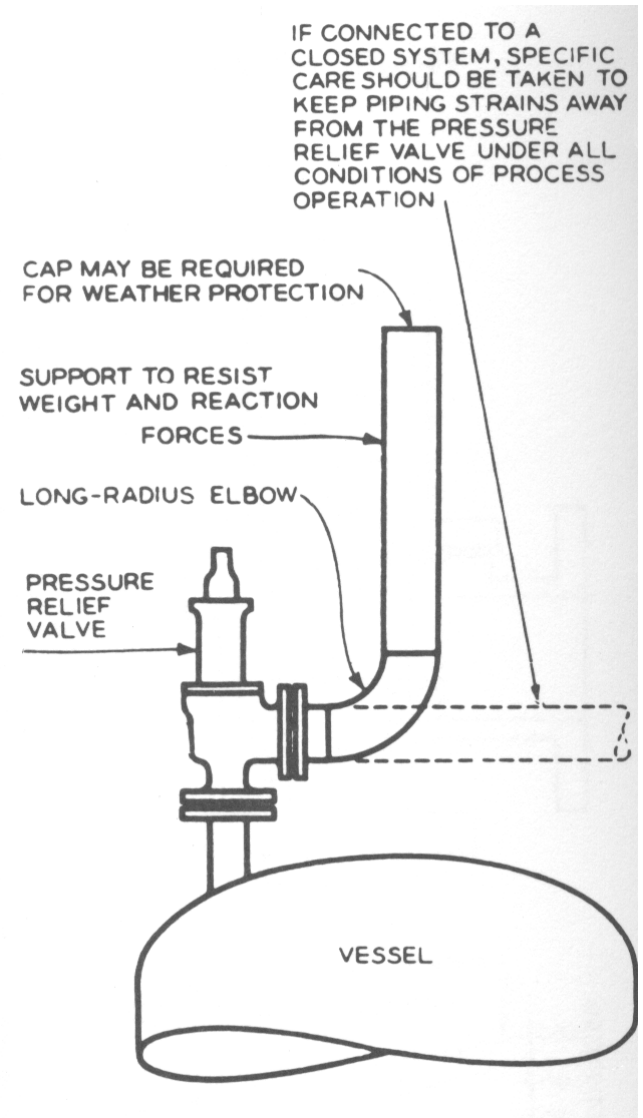
# Pressure Safety Valve Engineering

- Teledyne Fluid Systems / Farris Engineering
- Sizing according to ASME and API standards
- Selection according to catalog
- Conformance to engineering practice.  
e.g. revision control, auditability, accountability
- Combine best of engineering and CS practice

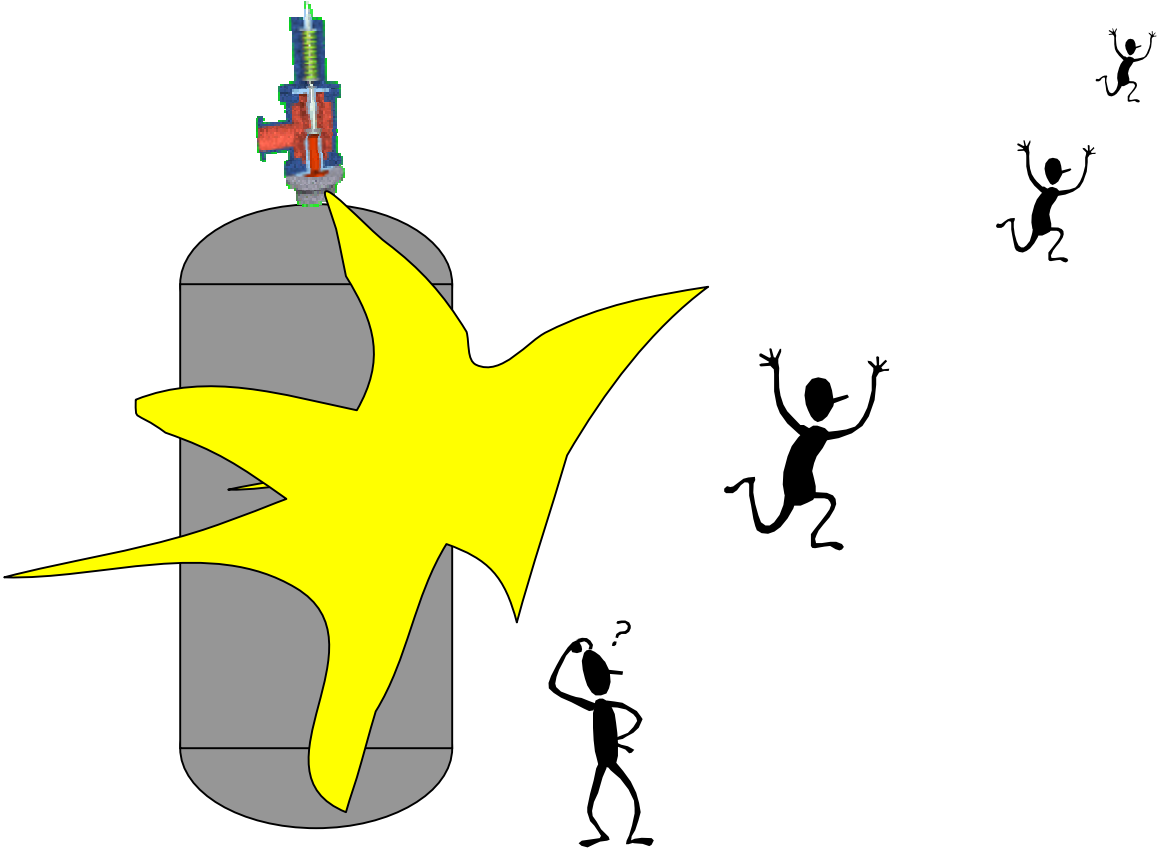
This:



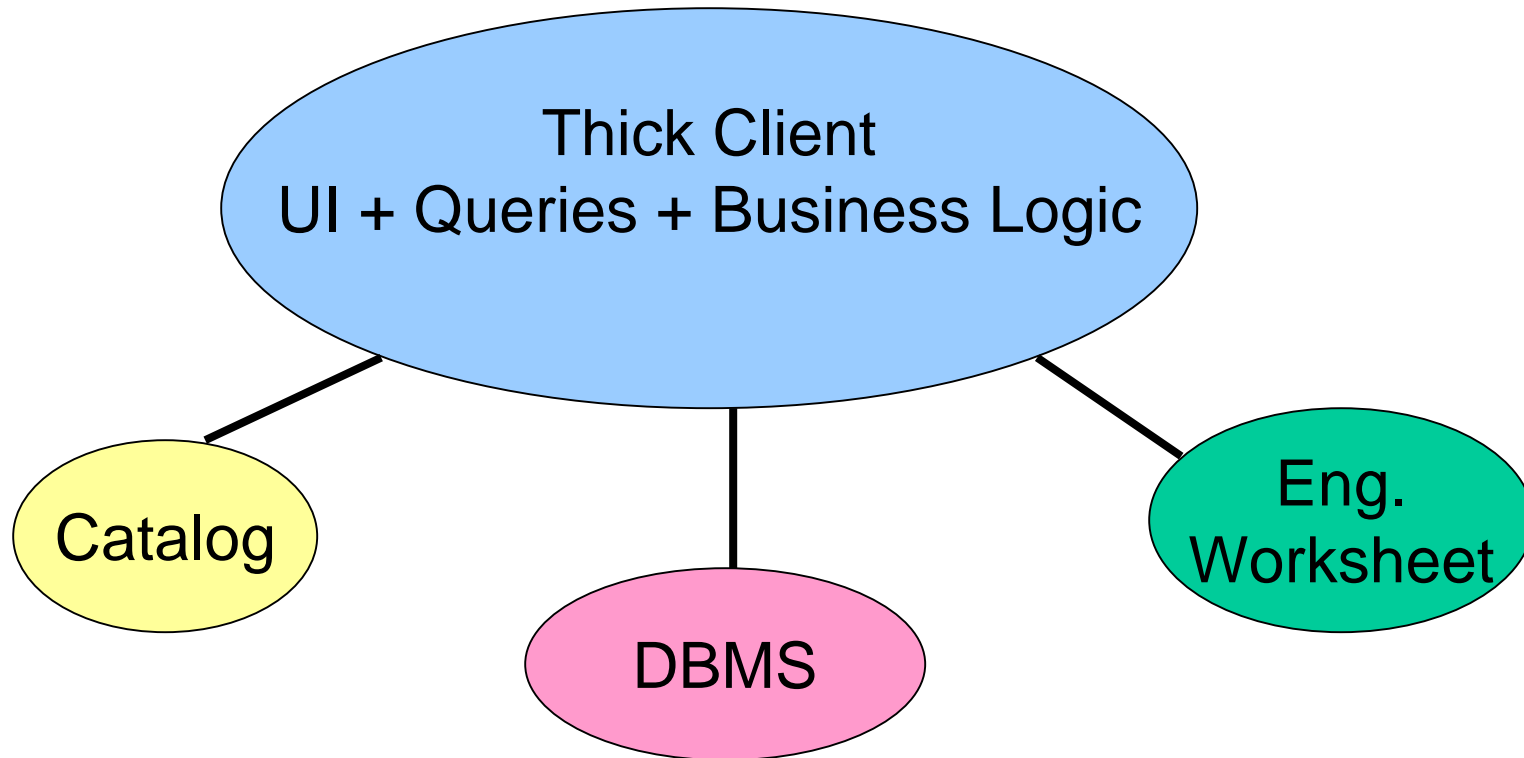
On this:



Prevents this:




We needed to build one of these as SizeMaster:




**SizeMaster 4.1.2.3 - [View Job - RE-3456-D - Redwater Expansion]**

File Edit View Tasks Report Option Arrange Window Help



Use the  icon to add a Tag, or double-click on a Tag to view it. 14:12




1. Job | 2. Job Details | 3. View Tag | 4. Quote | 5. Customer | 6. History | 7. Browse Tags


Job # RE-3456-D Description Redwater Expansion Status  Requisition # 375-007-D Revision # 0

Customer: ABC International  
 Prepared By: A. Person  
 Checked By: B. Person  
 Approved By: C. Person

Job Notes:  
 This job is being used to demonstrate SizeMaster Mark 4 functionality. No relationship to any real job is implied.

Action:  View Tag  Trouble

Tag #	Status	Type #	API	API Label	ASME
+10338					
10-PSV-134		26GA10-140/M1/SFG		0.503 in <sup>2</sup>	0.559 in
12-PSV-130		26DB14-120	D	0.110 in <sup>2</sup>	0.15 in

Browse Jobs |  View Job - RE-3456-D - Redwater Expansion

SizeMaster 4.1.2.3 - [Valve Worksheet - 10-PSV-134 - Demethanizer]

File Edit View Tasks Report Option Arrange Window Help

Use the Navigator to view a calculation. Strike F1 for Help. Use Esc/Done to close this View. 22:49

1. Job 2. Tag 3. Valve Wizard 4. Worksheet 5. History

Tag 10-PSV-134 - Demethanizer Status  Sizing Code: ASME Sec. 8 Computed Area: 0.42922 in<sup>2</sup>

**Navigator**

- r5 CalcVapMass
- r5 CalcGasVol
- r5 CalcSteam**
- r4 CalcKn
- r1 CalcKsh
- r1 LiqProps

**Inputs**

$W_{steam}$  500 lb/hr Required Capacity

$P_{relief}$  124.7 PSIA Relieving Pressure

$P_{set}$  100 PSIG Set Pres Valve Inl

$T_{relief}^{steam}$  800 °F Steam Relie Temperature

**Externals**

$P_{cause\ over}$  Loss of Coolant Cause of Overpressure (Optional)

**Outputs**

$A_{steam}$  0.11207 in<sup>2</sup> ASteam

**Locals**

$K_{sh}$  0.81 Superhea correctio

$K_n$  1 Napier st correctio

$A_{conven}$  0.11207 in<sup>2</sup> Area - Convent Pilot Va

$A_{bellow}$  Unknown in<sup>2</sup> Area - E Valve

**Calculation**

$$A_{conven} = \frac{W_{steam}}{51.5 K_{Gas} K_{CCF} P_{relief} K_b K_{sh}}$$

$$A_{bellow} = \frac{W_{steam}}{51.5 K_{Gas} K_{CCF} P_{relief} K_v K_{sh}}$$

Note: Pilot valves cannot be used with steam.

Browse | View Job - RE-3456-D - Redwater | View Tag - 10-PSV-134 - Der | Valve Wizard - 10-PSV-134 - De |  Valve Worksheet - 10-PSV-134 - D



**SizeMaster 4.1.2.3 - [View Type # 26GA10-140/M1/SP]**

File Edit View Tasks Report Option Arrange Window Help

Strike F1 for Help. Use Esc/Done to close this View. 14:14

1. Valve | 2. Black & White | 3. Parts List

**Type Number** Type Matches

26 G A 1 0 - 1 4 0 / M1 /SP

Series	(Pick One)
2600	Flanged / BalanSeal
2700	Series 2700 PSV
3800	Pilot Operated

**Description, Materials, Dimensions**

Series Number	26	Flanged / BalanSeal
ASME / API Area	G	0.559 / 0.503
Construction	A	Conventional
Temps & Mats	1	-20 to 450, CS/CS
Inlet Class	0	150#
Inlet Facing	1	Raised Face, ANSI Std.
Cap Constrn	4	Packed Lever
Test Gag	0	Without Gag
Special Material	M1	Standard / Standard
Connections		1.5 150 x 2.5 150

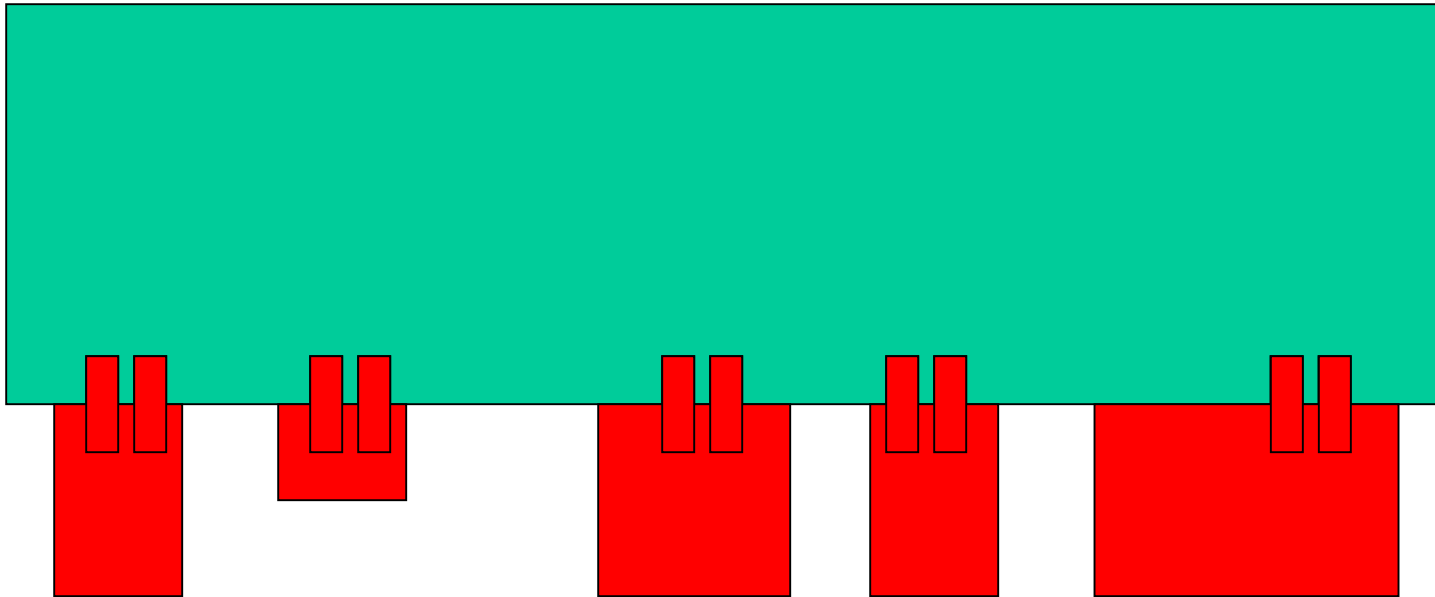
**Valve Drawing**  Fit?

Browse Jobs | View Job - RE-3456-D - Redwater Expansion | View Tag - 10-PSV-134 - Demethanizer | View Type # 26GA10-140/M1/SP

Clearly RAD project from beginning:

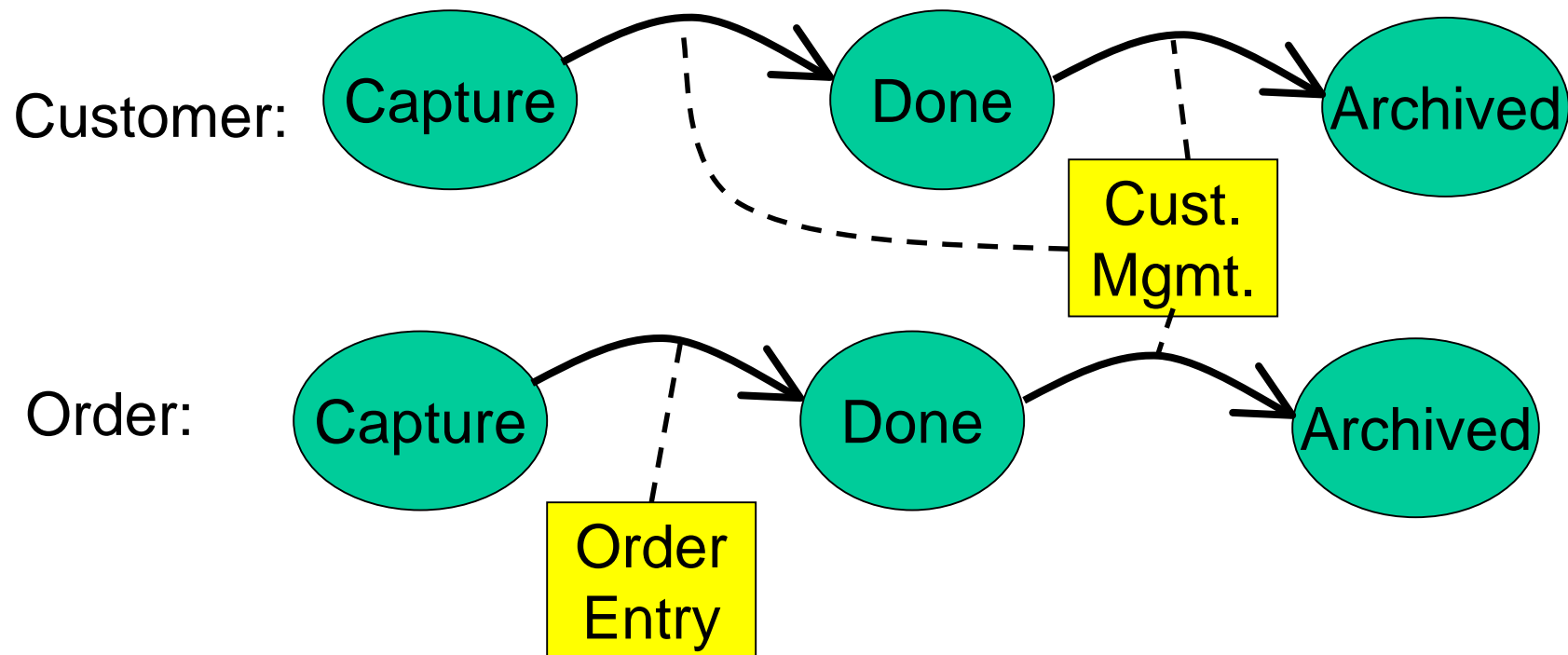
- Weak grasp of new workflow possibilities.
- Vaguely articulated services.
- Radical change in UI

Components + Framework are key to RAD:



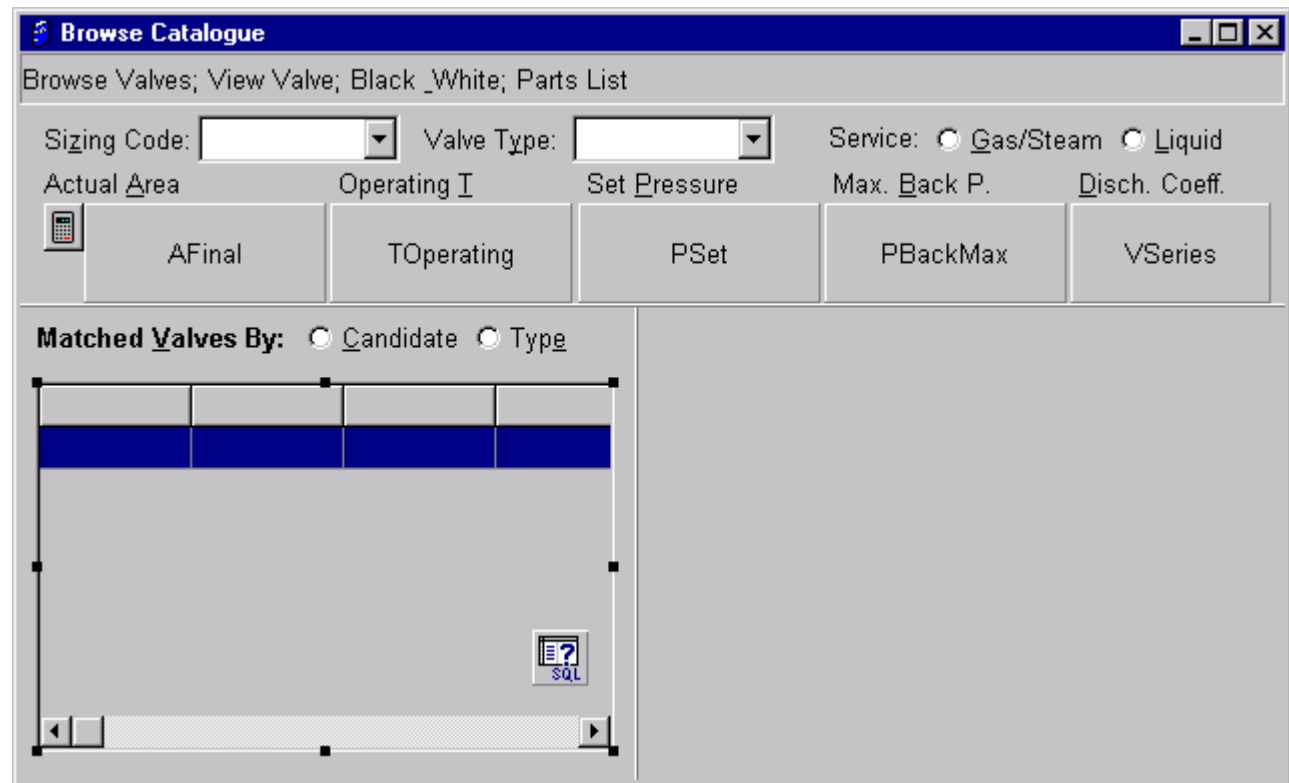
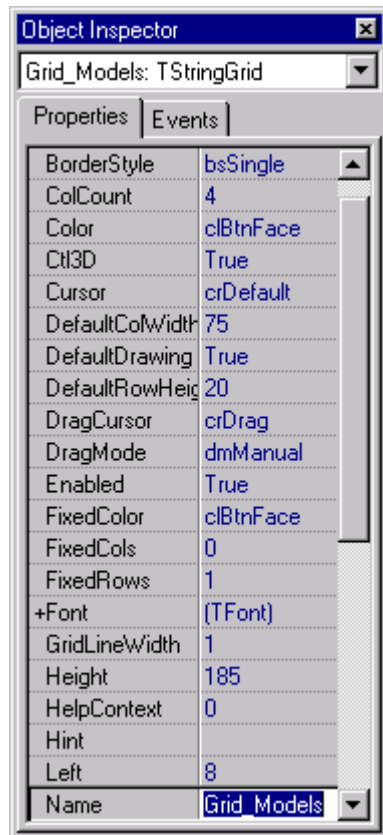
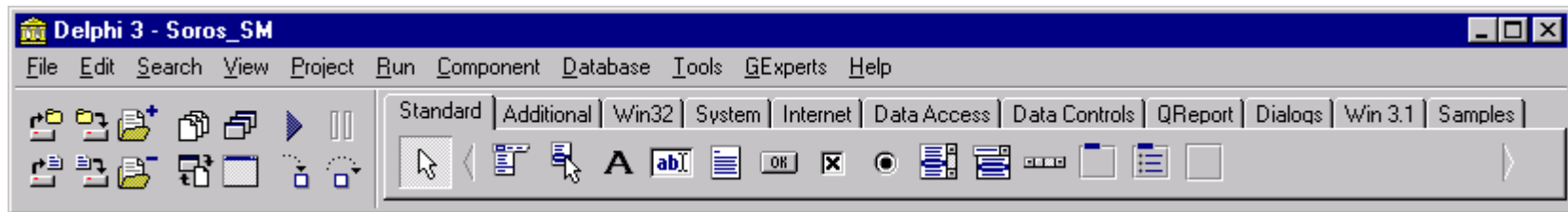
## How? Delphi IDE for “two-tier” model

- Business objects are stored in a DBMS
- Forms move objects between states in lifecycle.



## Delphi IDE for “two-tier” model

- IDE focuses on building forms
- Forms are containers for the components, e.g. UI and DBMS connections
- Business logic is spread over forms



**SizeMaster 4.1.2.3 - [Browse Catalogue]**

File Edit View Tasks Report Option Arrange Window Help

Fill in the parameters and pick a matched valve, use Option + Quick Size, or select a type number. 11:15

1. Browse Valves 2. View Valve 3. Black & White 4. Parts List

Sizing Code: ASME Sec.8 Valve Type: Service:  Gas/Steam  Liquid

Actual Area: 0.4 in<sup>2</sup> Operating I: 100 °F Set Pressure: 300 PSIG Max. Back P.: 6 PSIG Disch. Coeff.: Default

Matched Valves By:  Candidate  Type

Type #	ASME / API	Connections	Notes
26GA10	0.559 / 0.503	1.5-150 x 2.5-150	-20 to 450, CS/CS
26GA11	0.559 / 0.503	1.5-300 x 2.5-150	-20 to 450, CS/CS
26GA12	0.559 / 0.503	1.5-300 x 2.5-150	-20 to 450, CS/CS
26GA13	0.559 / 0.503	1.5-600 x 2.5-150	-20 to 450, CS/CS
26GA14	0.559 / 0.503	1.5-900 x 2.5-300	-20 to 450, CS/CS
26GA10*	0.559 / 0.503	1.5-150 x 2.5-150	-20 to 450, CS/CS
26GA11*	0.559 / 0.503	1.5-300 x 2.5-150	-20 to 450, CS/CS
26GA12*	0.559 / 0.503	1.5-300 x 2.5-150	-20 to 450, CS/CS
26GA13*	0.559 / 0.503	1.5-600 x 2.5-150	-20 to 450, CS/CS
26GA14*	0.559 / 0.503	1.5-900 x 2.5-300	-20 to 450, CS/CS
26GA15	0.559 / 0.503	2.0-1500 x 3.0-300	-20 to 450, CS/CS
26GA16	0.559 / 0.503	2.0-2500 x 3.0-300	-20 to 450, CS/CS
26GA20	0.559 / 0.503	1.5-150 x 2.5-150	450 to 800, CS/HT

Type Number: 26GA12 - 150 /

Series	(Pick One)
2600	Flanged / BalanSeal
2700	Series 2700 PSV
3800	Pilot Operated
6400	Power Boiler, Open Bonnet
6600	Power Boiler, Closed Bonnet
7000	Dyne-A-Master (Compressible)
7200	Dyne-A-Master (Liquid)

Browse Catalogue

But . . .

RAD **does not** imply good quality application



## Instead often get:

- no encapsulation of business objects, schema overly exposed
- mixing of UI and business logic
- services unarticulated, diffuse in implementation
- no unity over applications in same domain
- ad hoc, brittle architecture, hard to evolve

# Why?

Can look at RAD from two perspectives:

- User:  
business objects and workflow evolution
- Architecture:  
basic services identification and factoring

Most RAD is architecturally weak, even though components are good.

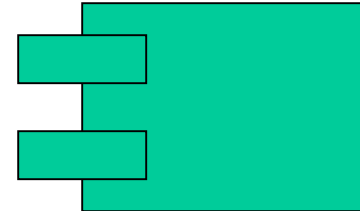
# Slogan

Services + Frameworks + Components

⇒ Quality RAD

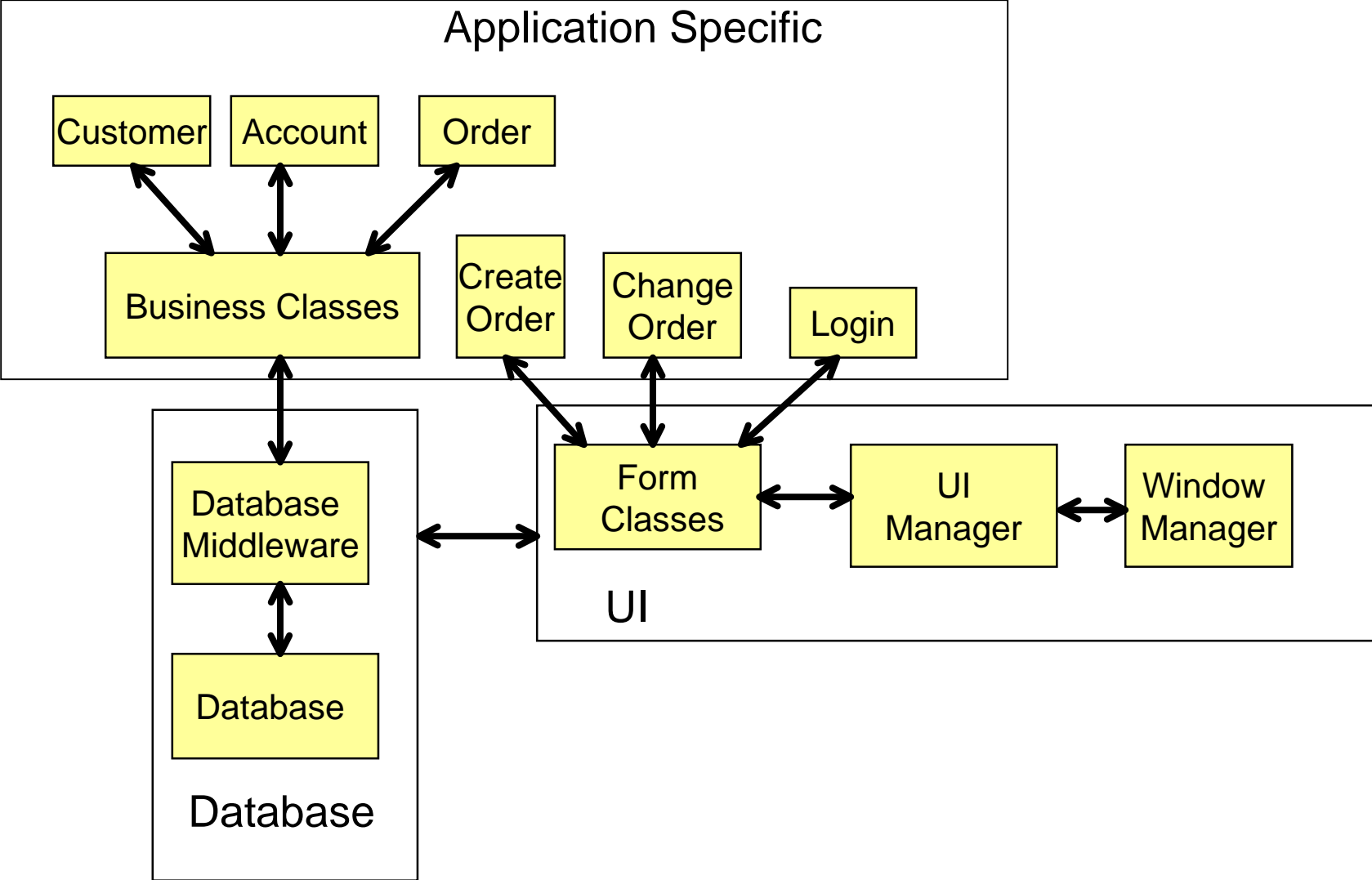
# What is a component?

- physical, precise thing
- replaceable
- realizes a set of *export* interfaces, its *capabilities*
- conforms to a set of *import* interfaces
- exists in an architectural context or *framework*
- combine into assemblies, themselves components



# What is a service?

- An exported interface that addresses some group of tasks.
- A collection of imported interfaces that establishes the context of the service.
- A service is not a component, it is an architectural element.



## A service is not a component

- A component is one way to realize a service, by exploiting the component's capabilities.
- but a service can be realized by a set of classes in the application framework, or even some piece of code.

# What is a framework?

- software architecture + implementation + hooks
- provides generic capabilities in some domain
- custom application specific code added at *hooks*

## Examples:

Inprise Delphi  
spreadsheet  
DBMS - DB2, Access  
San Francisco



# Frameworks

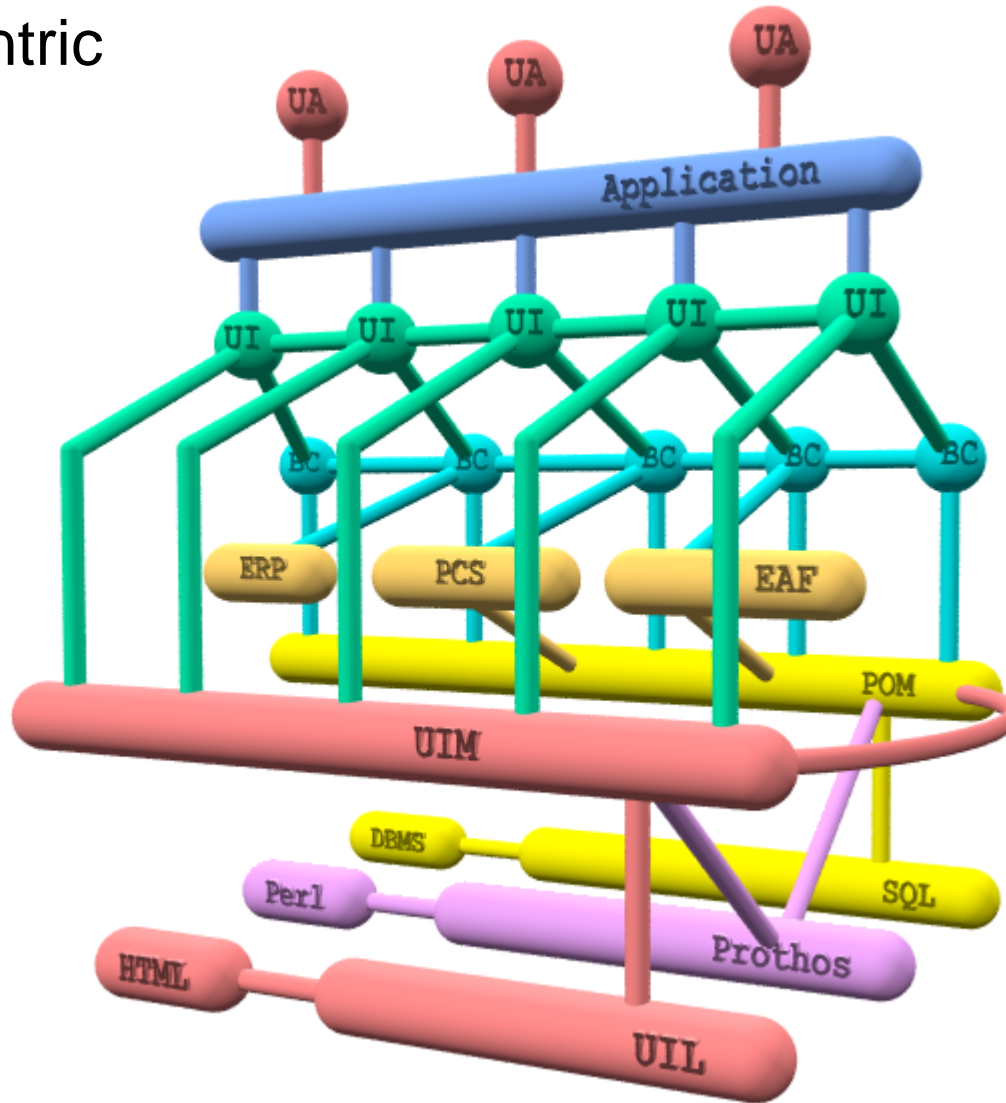
## Promise:

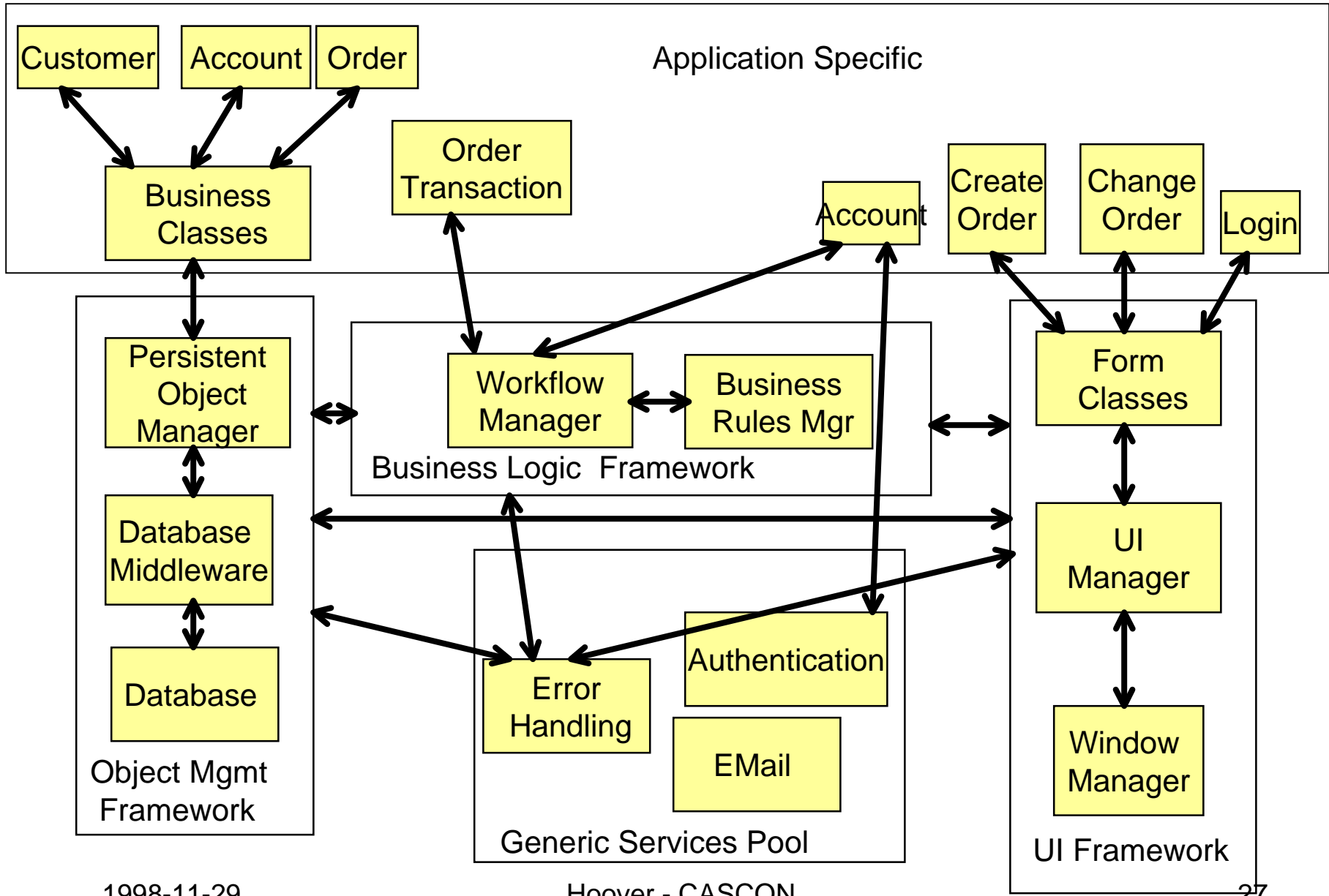
Leverage existing design and implementation common to all applications in a domain.

## Cost:

Must yield design authority and adapt your application to the overall architectural solution dictated by framework.

# Service-centric Framework





Claim: Quality applications are built by

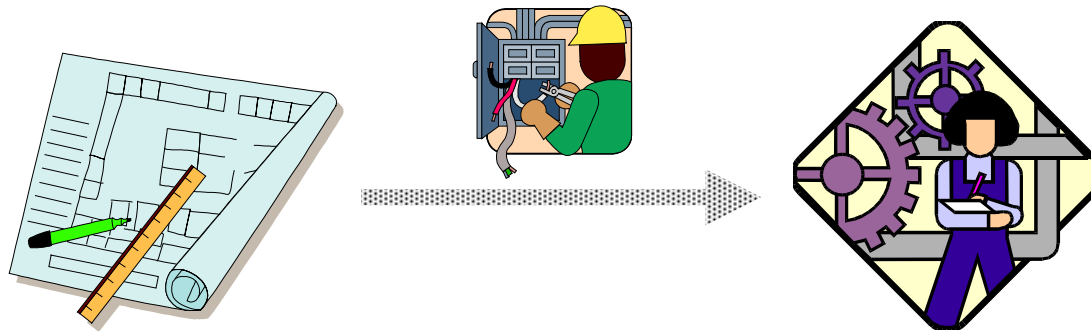
- identifying required services
- allocating services to components
- using frameworks to hook up and build components

This process is iterative and evolutionary.

A workshop is required to assemble components into a product.

The workshop provides:

- service decomposition
- an application framework
- a collection of components
- tools for customization



## Problem with unadorned off-the-shelf workshops:

- Few developers are good architects,
- Do not understand the underlying services and frameworks,
- Workshop provides no services, framework, or process guidance

# RAD Management Issue

Crucial to *choose the right workshop* for your RAD style.

Basic workshop IDE's like Delphi, ACCESS, VB, Java or workshop technologies like CORBA, DCOM, are *only good for Waterfall RAD*

What about Evolutionary RAD?

- The success of evolutionary RAD depends crucially on *identifying and factoring services*.
- Services are provided by components.
- Can acquire small and large commodity components from vendors.
- Construct service components by customizing a service-providing framework.
- All services are coordinated by a domain-specific application framework.



# Dangers

- Wrong level of abstraction for services
- Bad factoring of services
- Cross-component services,  
E.g. trouble handling

# Conclusion

- functional decomposition isn't dead yet, we just call them services
- commodity components can be bought
- some large scale ones need to be built
- good domain-specific application framework is key