



# Step-by-step Demonstration: How to Design a Structured Web Dynpro Application

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## Learning Objectives

### As a result of this workshop, you ...

- get an overview of SAP NetWeaver
- get an impression of the Development Environment
- understand the basic concepts of Web Dynpro
- become acquainted with designing a Web Dynpro Application
- get an introduction to reusing components
- learn more about user interface patterns

# *SAP brings in experience with team development of business applications from the ABAP into the Java world*



## Agenda

### Demo Application

#### SAP NetWeaver Overview

#### Development Environment

- SAP Web Application Server
- Development Infrastructure
- SAP NetWeaver Developer Studio

#### Web Dynpro Introduction

#### Step-by-step Web Dynpro Application Development

- Architecture Design
- Detail Design
- Implementation

#### Web Dynpro Essentials

- Web Dynpro Components
- Web Dynpro Patterns

#### Summary



# Book2Fly Demo Application



## Welcome to BOOK2FLY



# Book2Fly Demo Application - Searching

The screenshot shows a web browser window displaying the Book2Fly application. The browser address bar shows the URL: C:\Downloads\SAP\Events\TechEd.asVegas2003\StepByStepDemonstration\FlashFile\Book2Fly\lights.swf. The application interface features a navigation bar with tabs for Flights, Guides, and Routes. Below this is a search form with fields for From, To, and Date. The search results are displayed in a table with columns for Airline, City from, City to, Departure date, Departure time, Arrival date, and Arrival time. The selected flight is United Airlines from Frankfurt to San Francisco on 11/27/03 at 2:30:00 PM, arriving at 5:00:00 PM. Below the table, there is a Flight Details section showing Price (879.02), Currency (USD), Departure airport (FRA), Arrival airport (SFO), Airline identification (UA), and Connect identification (0941). A pie chart shows the seat availability, with 100% of seats available. A 'Check' button is located at the bottom right of the details section.

Airline	City from	City to	Departure date	Departure time	Arrival date	Arrival time
Singapore Airlines	SINGAPORE	SAN FRANCISCO	11/27/03	5:00:00 PM	11/27/03	7:25:00 PM
Singapore Airlines	SAN FRANCISCO	SINGAPORE	09/7/03	4:00:00 PM	09/9/03	2:45:00 AM
Singapore Airlines	SAN FRANCISCO	SINGAPORE	11/06/03	4:00:00 PM	11/06/03	2:45:00 AM
United Airlines	FRANKFURT	SAN FRANCISCO	09/0/03	2:30:00 PM	09/0/03	5:00:00 PM
United Airlines	FRANKFURT	SAN FRANCISCO	11/27/03	2:30:00 PM	11/27/03	5:00:00 PM

**Flight Details**

Price: 879.02  
Currency: USD  
Departure airport: FRA  
Arrival airport: SFO  
Airline identification: UA  
Connect identification: 0941

100% Booked seats 0% Available seats

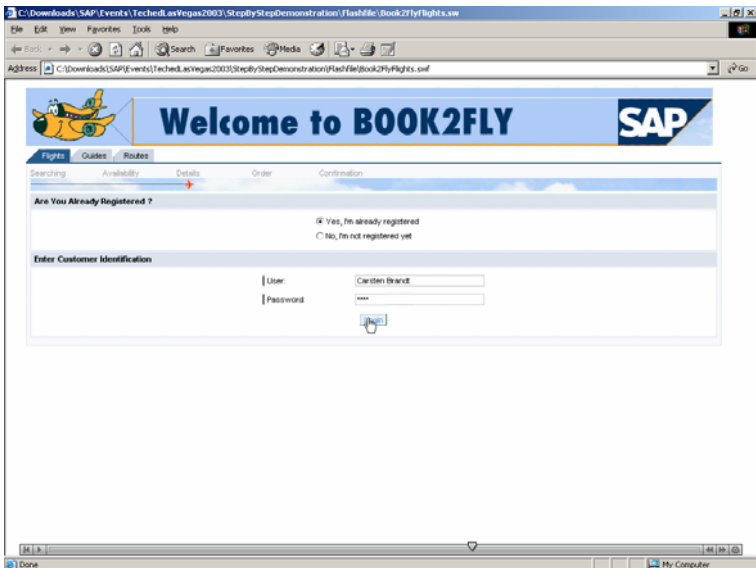
Check



# Book2Fly Demo Application - Availability



# Book2Fly Demo Application - Details



# Book2Fly Demo Application - Order

**Welcome to BOOK2FLY** **SAP**

Flights Guides Routes

Searching Availability Details **Order** Confirmation

1. Show Flight Data

2. Show Customer Details

Form: Name: Mr. Carsten Brandt Street: In der Strasse 1  
Zip: 123456 City: Igenheim  
Country: Germany Phone: +49123456789  
Email: carsten.brandt@sap.com

3. Edit Billing Options

Credit card type:

Visa  Mastercard  Discover  American Express

Credit card number:  Secure Data  Credit card expiration date:

4. Order Ticket

Please, take a look of the above flight and customer data and be sure that all inputs are correct before you order.

Do you wish a confirmation via email?



# Book2Fly Demo Application - Confirmation

**Welcome to BOOK2FLY** **SAP**

Flights Guides Routes

Searching Availability Details Order **Confirmation**

Confirmation

Start New Booking

2 Your Flight Confirmation - Flight Number SQ0015 - Message (Plain Text)

File Edit View Insert Format Spelling Actions Help

Ctrl+Z Ctrl+Y Reply to All Forward

From: SAP Web Content Sent: Fri 02/02/2003 11:06 AM  
To: Brandt, Carsten  
Cc:  
Subject: Your Flight Confirmation - Flight Number SQ0015

Dear Mr. Carsten Brandt,

Thank you very much for booking with Book2Fly. In the following you can find your confirmation, which includes your flight data, your personal details and your billing options. We hope that you were satisfied with our online booking store and wish you a comfortable flight.

Regards,  
Your Web Content Team

Regards,



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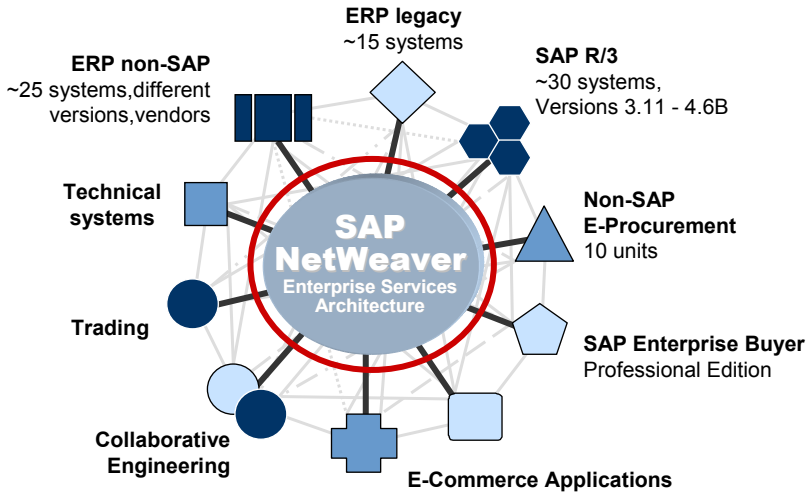


## SAP NetWeaver in One Statement

*SAP NetWeaver is an application  
and integration platform for  
both the ABAP and the Java  
world*



# Business Universe



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# SAP NetWeaver

SAP Mobile Infrastructure

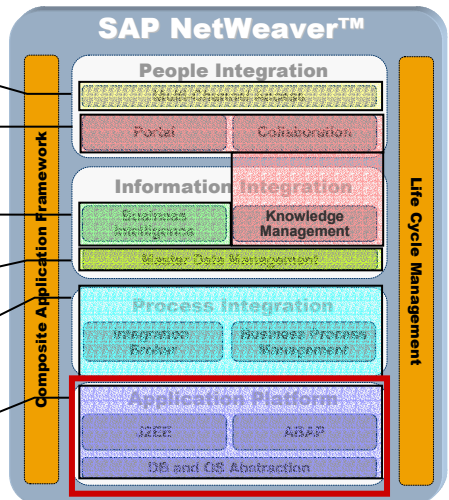
SAP Enterprise Portal

SAP Business Warehouse

Master Data Management

SAP Exchange Infrastructure

SAP Web Application Server



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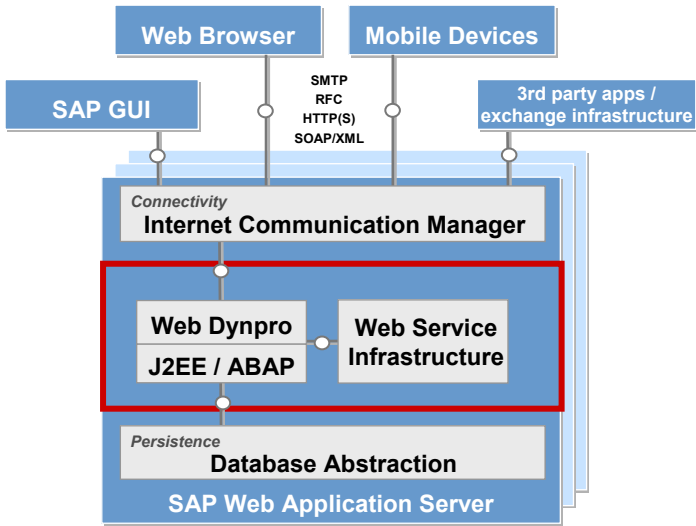
## SAP Web Application Server in One Statement

*The SAP Web Application Server is the foundation of all SAP solutions and all custom-developed applications*

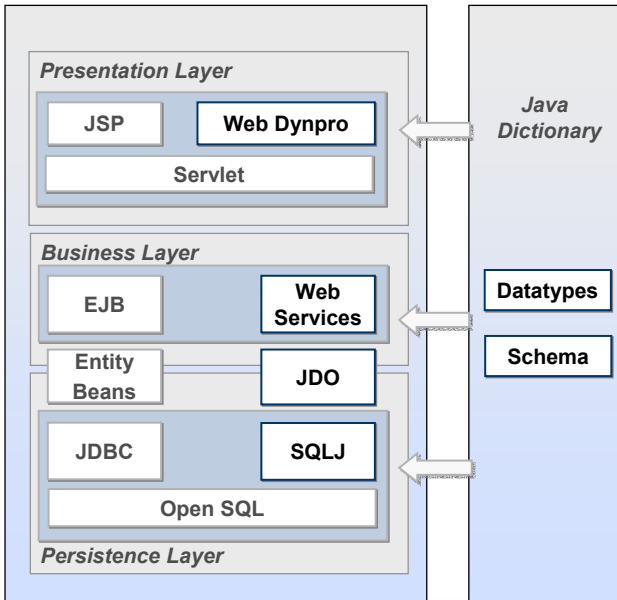




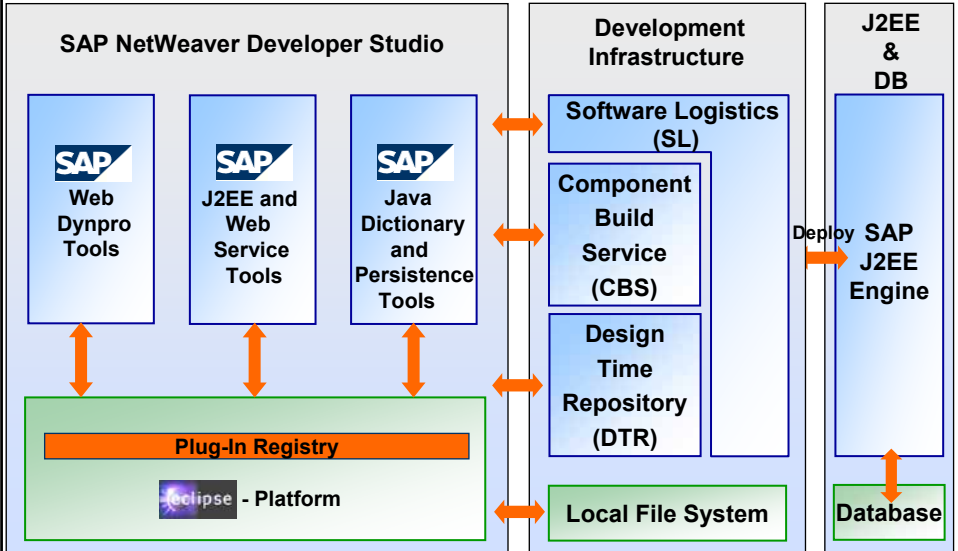
# SAP Web Application Server 6.30



# Extended SAP J2EE Programming Model



## Development Cycle



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***SAP offers an integrated and robust infrastructure for all of your development processes and life cycles***

## **Motivation for a new Development Infrastructure**

**Most J2EE environments in the market offer a rather limited development infrastructure**

**A significant amount of manual work is necessary to setup a consistent Java development environment on a developer's machine for each project**

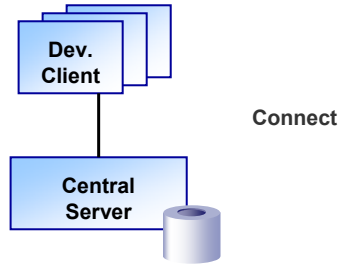


**Idea: Combine a local and file based design time architecture with the advantages of an integrated server-based environment such as ABAP**

# Development Infrastructure ABAP / Java

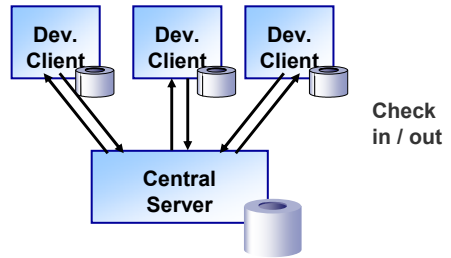
## ABAP

- Complete central environment for build and test
- Instant build
  - ◆ Minimal
  - ◆ Complete
- Continuous integration test

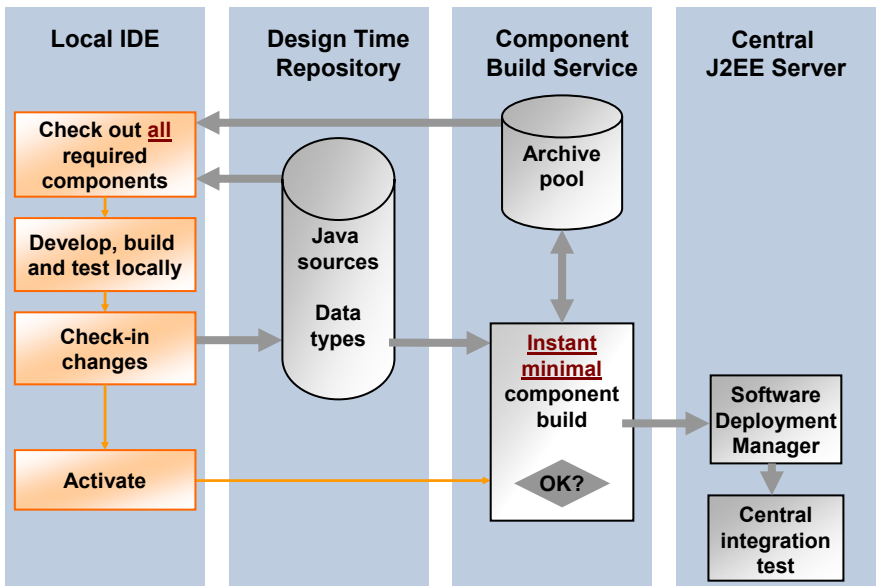


## Java

- Independent from central server
  - ◆ Availability
  - ◆ Performance
  - ◆ Offline usage
- Local files and folders
- Local test environment



# SAP's Java Development Infrastructure



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## SAP NetWeaver Developer Studio in One Statement

*The SAP NetWeaver Developer Studio is based on Eclipse and contains a complete toolset for developing business applications*



## SAP NetWeaver Developer Studio is based on Eclipse

SAP provides a complete set of tools (perspectives) with Eclipse user interface look and feel

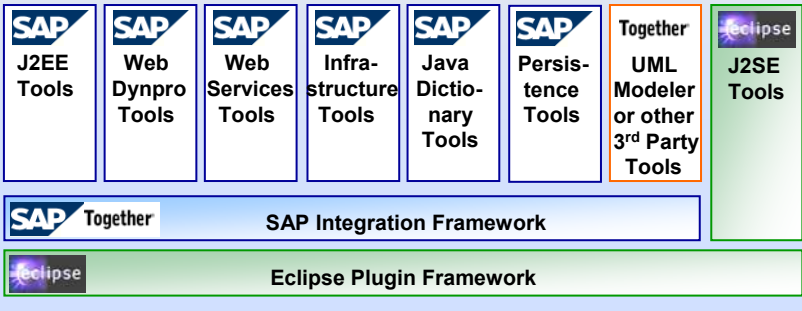
Allow customers and partners to extend the tooling environment through the plug-in architecture of Eclipse

Offer an individual and personalized access to the various development tools through Eclipse perspectives (customized tool sets)

Seamless integration of all development tools into SAP's development infrastructure (design time repository, change management, software logistics)



## SAP NetWeaver Developer Studio Software Layers



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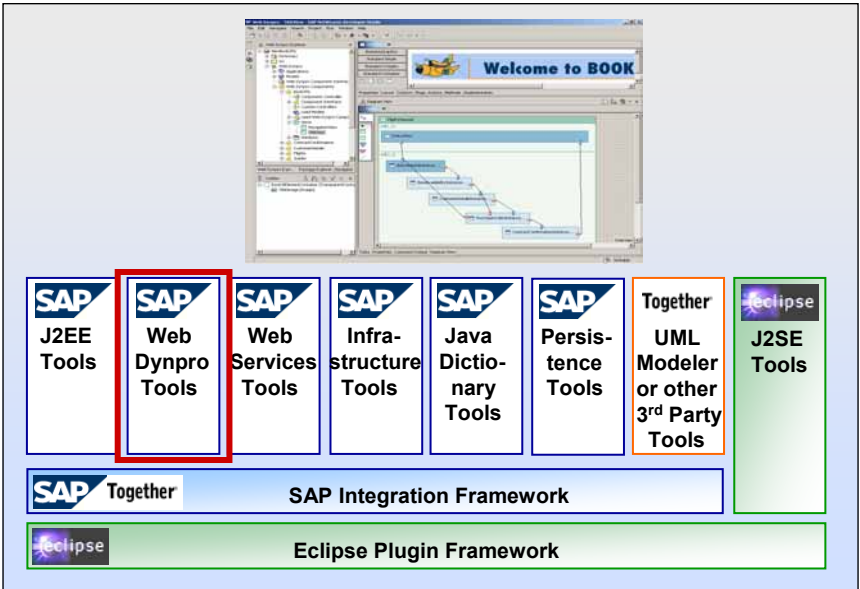


## Web Dynpro in One Statement

***Beside standard J2EE, SAP supports higher-level programming models like Web Dynpro, which is SAP's development and runtime environment to create professional Web business applications and their user interface***



# SAP NetWeaver Developer Studio Software Layers



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## Web Dynpro Main Benefits

### Deliver an Enterprise Quality Web Development Environment

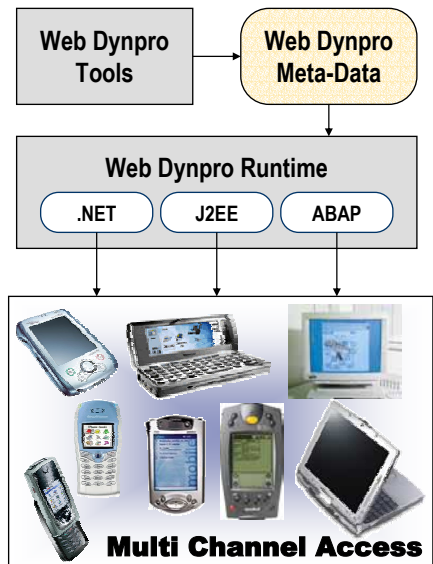
- minimize coding, maximize design
- separate layout and logic
- support arbitrary backends
- support reuse of components
- configuration of UI patterns
- support web services and data-binding

### Achieve Independence

- run on multiple platforms

### Improve User Experience through a "High Fidelity Web UI"

- browser based, zero footprint
- screen updates w/o page reloads
- client-side dynamics
- performance through caching
- 508 accessibility compliance
- flicker-free screen, minimal refreshes
- personalization of the user interface



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# Web Dynpro Programming Paradigm

## Reusable components

- Construct applications from „patterns“

## Generic services based on data type information

## As much abstraction and as few coding as possible

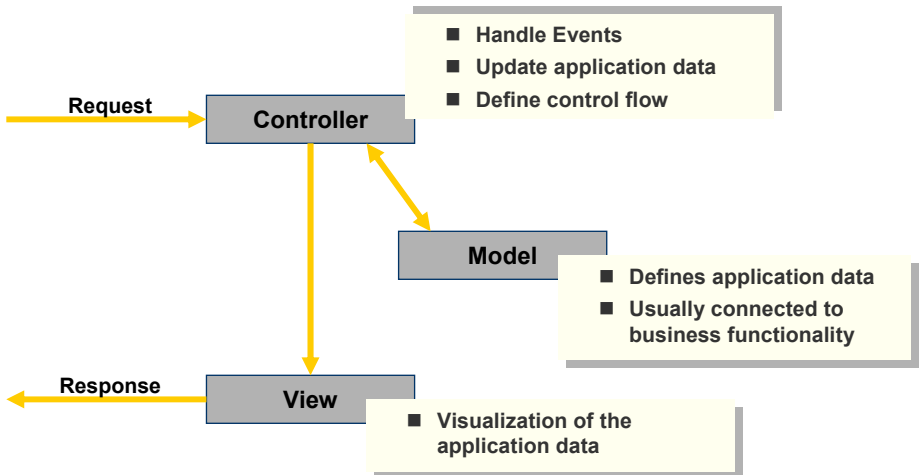
- Graphical management of screen space
  - ◆ view layout
  - ◆ view navigation
  - ◆ view nesting
- Declarative management of application data
  - ◆ data structures
  - ◆ data flow
  - ◆ local vs. global data

## Model-View-Controller architecture

- **Model:** encapsulates the business logic and persistence
- **View:** defines the visualization of data
- **Controller:** handles events, updates the model, shows the next view

# Model View Controller (MVC)

Design Pattern for decoupling presentation and logic of an application



### Views and layouts

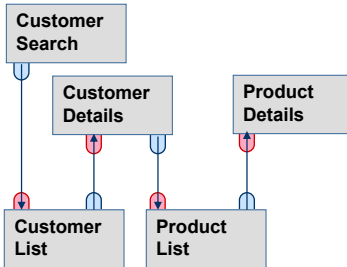
Product Details	
Product ID	Agfa Digital Camera
Product Name	02394
Description	Agfa Digital Camera
Device ID	
Ref No	02394
House No. / Street	123 / Main St.
City	Cincinnati
Zip Code	86221
State	OH
<input type="button" value="Confirm"/>	

Product Details

Each view has its own layout



### Navigation links

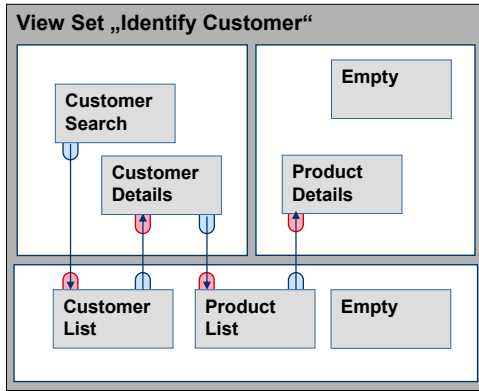


Each view has its own layout

Navigation links define possible view sequences



View sets and view areas



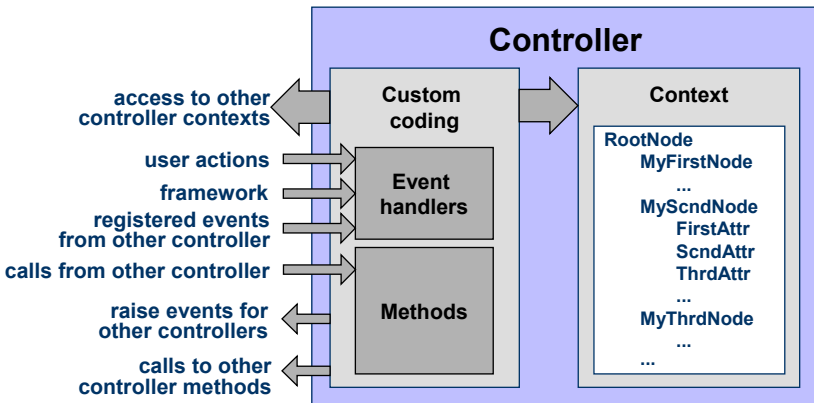
Each view has its own layout

Navigation links define possible view sequences

A view area can display multiple views, but only one at a time

View sets are arrangements of view areas

Controller = Context (Local Data) + Custom Coding

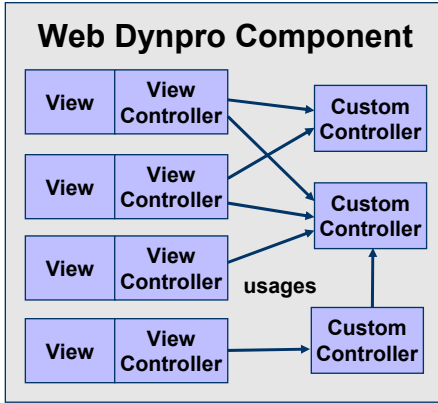


Access to other controllers is ruled by "usage" relations

Custom coding is required for things that can not be expressed in the meta-model

Each controller owns a hierarchically structured set of local data, called the controller's context

Views and Controllers



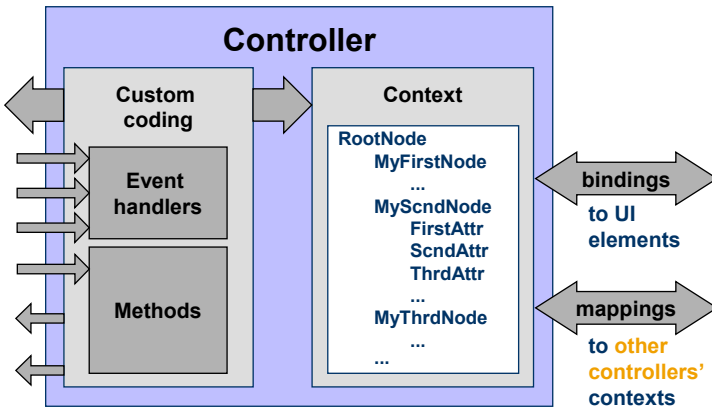
**Views** define what the user sees on the screen

**View controllers** handle events from the user

**Custom controllers** offer global services



Bindings and Mappings



Access to other controllers is ruled by "usage" relations

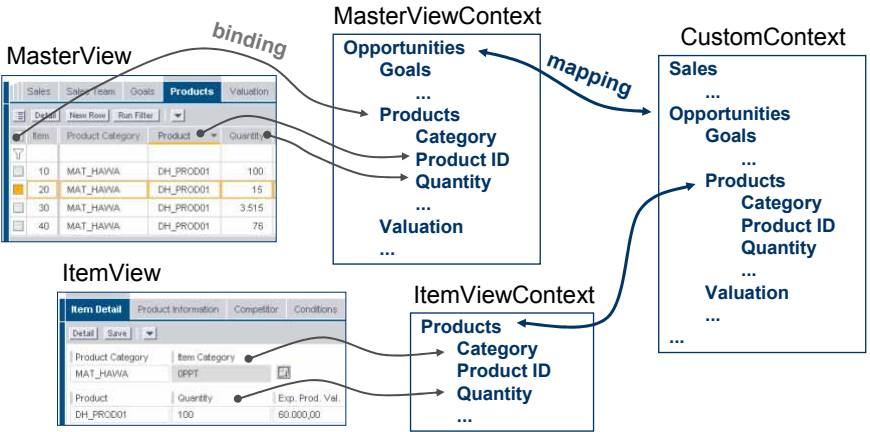
**Custom coding** is required for things that can not be expressed in the meta-model

Each controller owns a hierarchically structured set of local data, called the controller's **context**

**Bindings** and **mappings** are for automatic data exchange



Automatic data transport through binding & mapping



The controls in each view can be bound to the context of the view controller

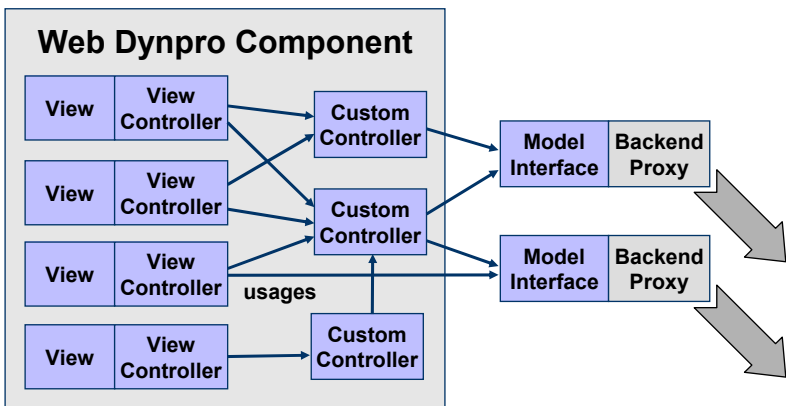
Some controls (e.g. TableView) can be bound to **multiple nodes**

Context nodes can be **mapped** to similar nodes in other contexts

Mappings will propagate data and selection state back and forth



Model-View-Controller



**Views** define what the user sees on the screen

**View controllers** handle events from the user

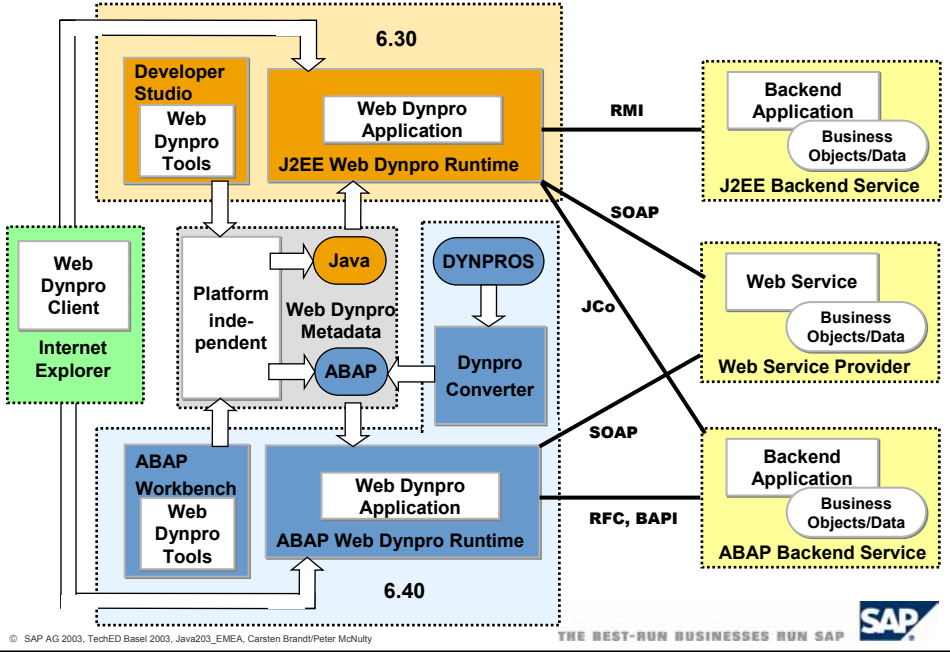
**Custom controllers** offer global services

**Models** provide access to the interfaces in the backend

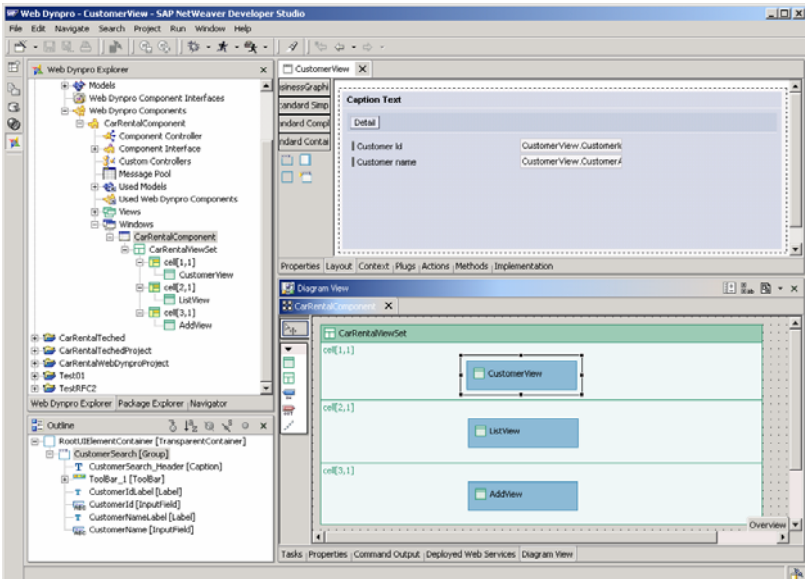
**Proxies** connect to the backend system (mySAP, Web Services, ...)



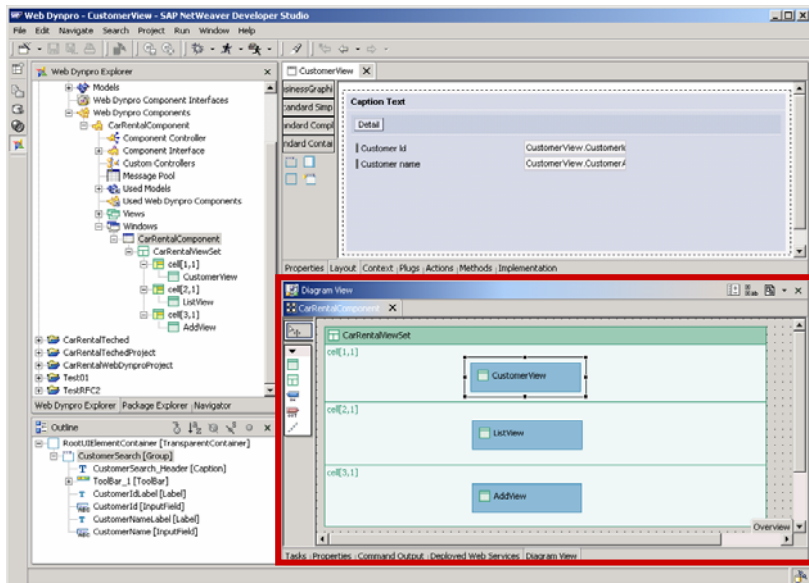
# Web Dynpro Across Multiple Platforms



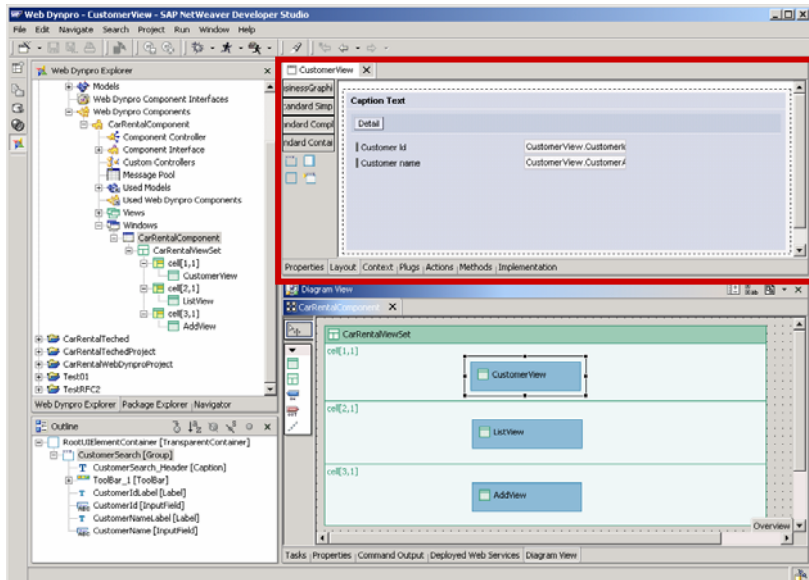
# Web Dynpro Tools



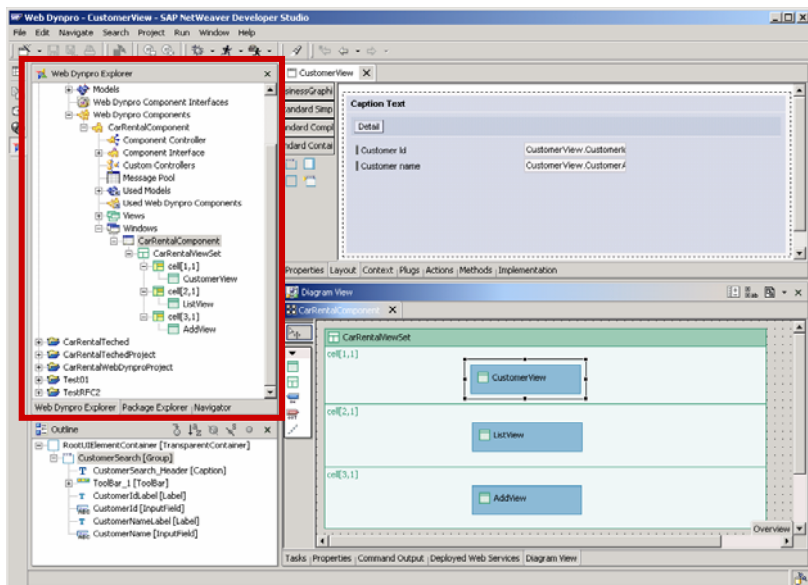
# Web Dynpro Tools – Application Modeler



# Web Dynpro Tools – View Designer



# Web Dynpro Tools – Web Dynpro Explorer



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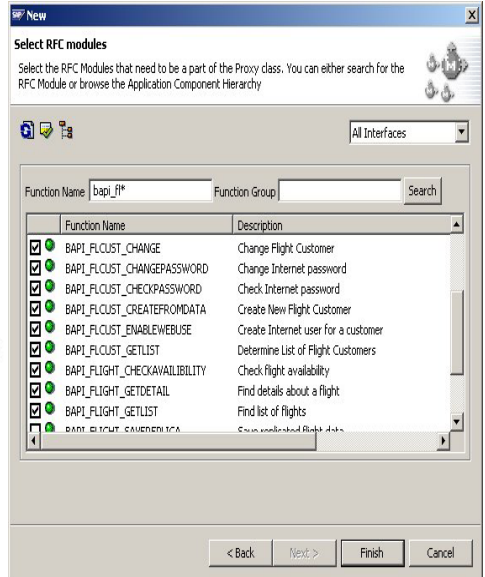
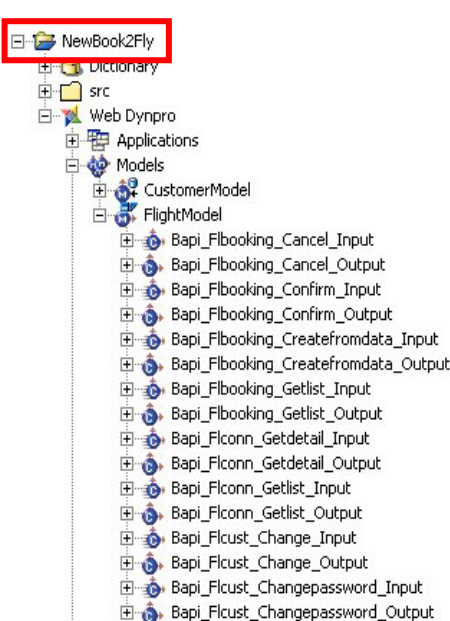
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*The architecture design consists of decisions on the role of the application in subapplications, the assignment of subapplications to components and other decisions on concepts and procedures that outline the detail design.*

## 1. Step: Identify backend and create model



## 2. Step: Identify components

Book2Fly (integrates several travel services)

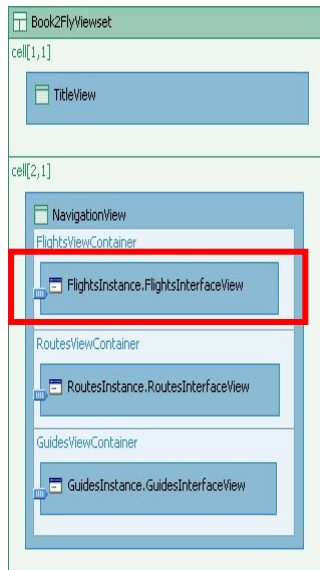
- Flight (allows a flight booking)
  - ItemSearch (allows the flight search)
  - ItemAvailability (seat availability of a flight)
  - CustomerDetails (maintains the customer data)
  - PurchaseOrder (executes the flight booking)
  - ContractConfirmation (confirmation of a flight booking)
- Guide (offers informations about the world)
- ...

## 3. Step: Define structure

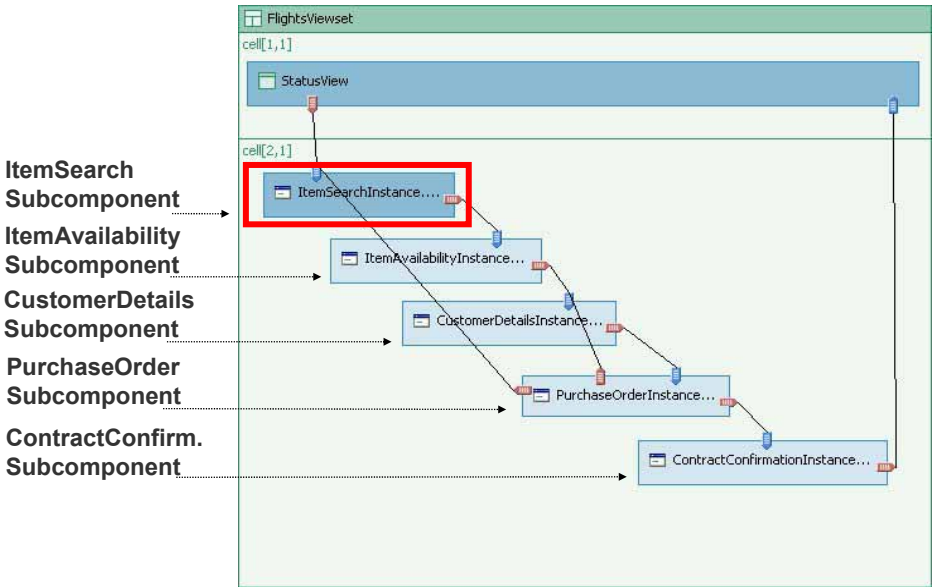
Flight Component

Route Component

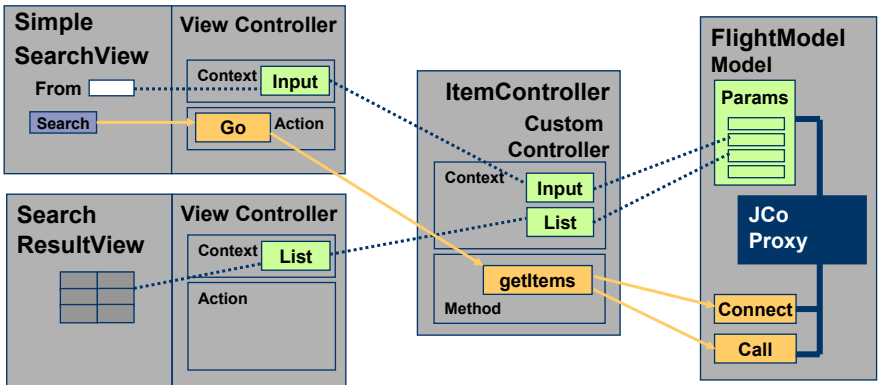
Guide Component



## 4. Step: Define navigation



## ItemSearch Architecture (only an excerpt)



## 5. Step: Identify the context elements

Executing a simple flight search requires ...

- Departure location (type: string)
- Arrival location (type: string)
- Departure date (type: date)
- List of flights (type: collection)



## 6. Step: Identify methods and actions

Book2Fly requires following methods and actions ...

- method: getFlights  
determines all flights that meet the previously selected criteria
- action: GoSimple  
triggers a simple flight search



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## Detail Design in One Statement

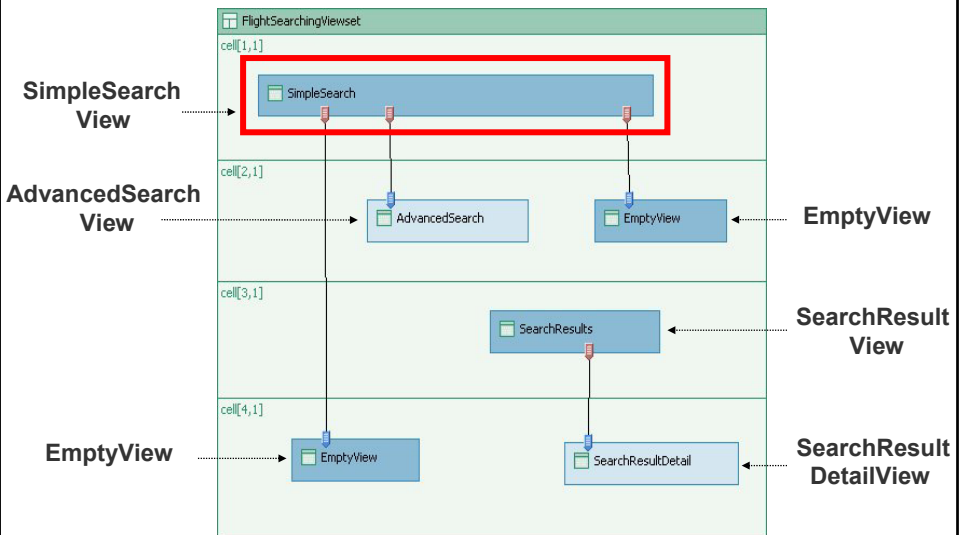
*In the detail design the complete internal component structure will be added, which is used for the implementation of operations.*

## 7. Step: Identify views

ItemSearch consists of following views ...

- **SimpleSearchView**  
entry option for simple flight search criteria
- **AdvancedSearchView**  
entry option for advanced flight search criteria
- **SearchResultView**  
table of flights found
- **SearchResultDetailView**  
detail information about selected flight in the table

## 8. Step: Define view layout and the navigation



## 9. Step: Identify controls

SimpleSearchView consists of following controls ...

- **3 Labels:**
  - Departure location (“From:”)
  - Arrival location (“To:”)
  - Departure date (“Date:”)
- **3 InputFields:**
  - Departure location
  - Arrival location
  - Departure date
- **2 Buttons:**
  - Advanced search (“Open Advanced Search”)
  - Search start (“Go!”)



## 10. Step: Define the layout of controls

Search Flight

| From: SimpleSearch.MyCityFrom | To: SimpleSearch.MyCityToKe | Date: SimpleSearch.Bapifli | Go! | Open Advanced Search



## 11. Step: Identify the context of elements and mappings

SimpleSearch x

### Context

Context

- BapiFlightGetListInput
  - DateRange
  - DestinationFrom
  - DestinationTo
  - IsAdvancedSearchOpen
  - MyCityFromKeyValueType
  - MyCityToKeyValueType

FlightController - com.sap.demo.book2fly.flights.searching

Context

- BapiFlightGetDetailInput
- BapiFlightGetListInput
  - DateRange
  - DestinationFrom
  - DestinationTo
  - Output
  - Airline
  - Max\_Rows

FlightModel

Properties | Layout | Context | Plugs | Actions | Methods | Implementation

## 12. Step: Bind the controls

### Search Flight

From:  To:  Date:

Properties

Property	Value
Elementproperties of InputField	
enabled	true
id	FromInput
length	20
passwordField	false
readOnly	false
size	standard
state	normal
tooltip	
value	SimpleSearch.MyCityFromKeyValueType
visible	visible

Tasks | Properties | Command Output



## 13. Step: Declare methods and actions

The screenshot shows the SAP IDE interface for configuring a controller. The main window is titled "ItemController" and "SimpleSearch". The "Actions" tab is active, displaying a table of actions and their event handlers.

**Actions**

Name	Event handler	Text
AdvancedSearch	onActionAdvancedSearch	
GoSimple	onActionGoSimple	

**Parameters**

Name	Type

At the bottom of the IDE, the "Actions" tab is selected in the navigation bar.

## 14. Step: Bind the actions

### Search Flight

From: SimpleSearch.MyCityFrom | To: SimpleSearch.MyCityToKe | Date: SimpleSearch.BapiFl | **Go!** | Open Advanced Search

The screenshot shows the SAP IDE interface for binding an action to a button. The "Properties" window is open, showing the properties of a button. The "onAction" property is highlighted with a red box, and its value is "GoSimple". A dashed arrow points from the "Go!" button in the "Search Flight" form above to the "GoSimple" value in the "onAction" property.

Property	Value
Elementproperties of Button	
design	standard
enabled	true
id	GoButton
imageAlt	
imageFirst	true
imageSource	
size	standard
text	Go!
tooltip	
visible	visible
width	60
Event	
onAction	GoSimple

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## Implementation in One Statement

*The implementation phase follows the design process and transfers the design decisions to the peculiarities of a language.*

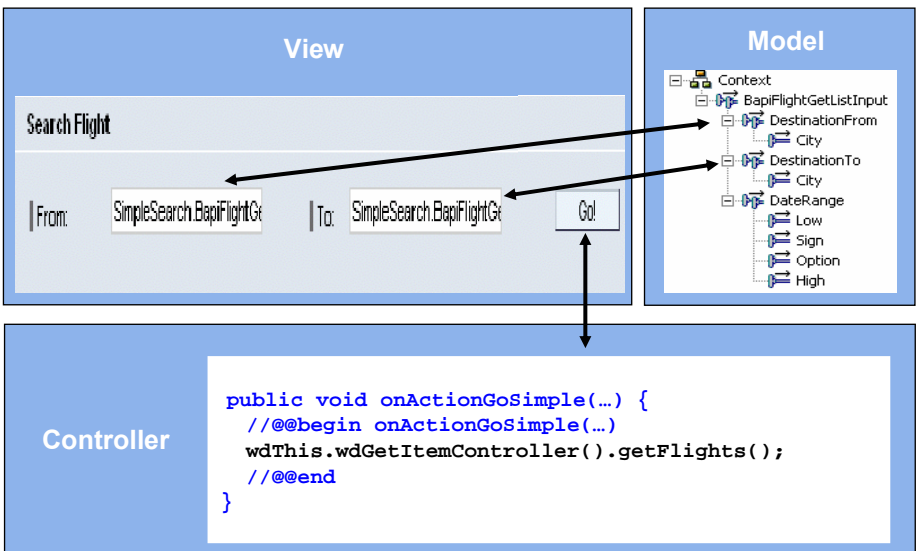


## 15. Step: Implement methods and event-handlers

```
public void onActionGoSimple( ) {
    //@@begin onActionGoSimple()
    wdThis.wdGetItemController().getFlights();
    //@@end
}

public void getFlights( ) {
    //@@begin getFlights()
    client.connect();
    try {
        wdContext.currentFlightListInputElement().modelObject().execute();
    }
    catch (Exception ex) {
        /* exception handling */
    }
    finally {
        client.disconnect();
    }
    //@@end
}
```

## Bind Model, View and Controller together



## Agenda

Demo Application

SAP NetWeaver Overview

Development Environment

- SAP Web Application Server
- Development Infrastructure
- SAP NetWeaver Developer Studio

Web Dynpro Introduction

Step-by-step Web Dynpro Application Development

- Architecture Design
- Detail Design
- Implementation

Web Dynpro Essentials

- Web Dynpro Components
- Web Dynpro Patterns

Summary



## Web Dynpro Components in One Statement

*Web Dynpro Components  
break down applications into  
manageable parts, which can  
be reused.*



# Web Dynpro Components - Benefits

Break down applications into manageable parts

- Distribute work between developers

Construct reusable building blocks

- Components can use other components

Decouple software projects

- Component user can program against separately defined component interface
- Component implementation can be provided (or selected) later on

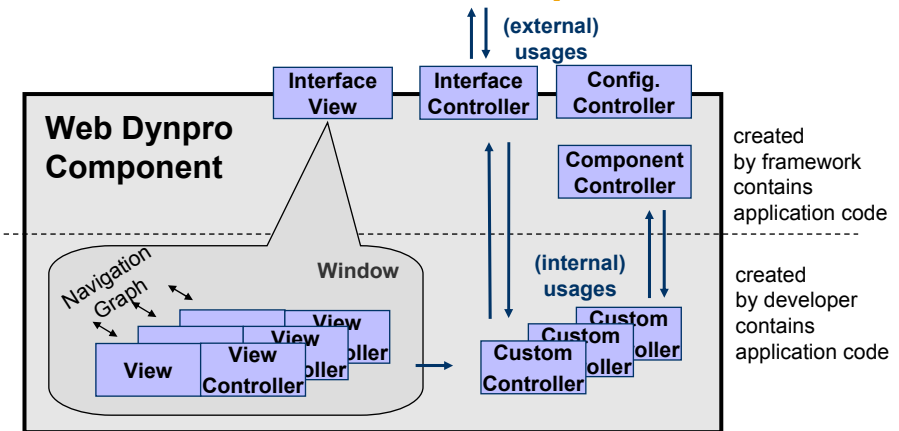
Support pattern-based UI development

- Implement each sub-pattern as a component



# Web Dynpro Components – Controllers and Views

## The Interface of a Component



A component's **interface view** can be used like a normal view in the embedding component's navigation graph

A component's **interface controller** can be used by the embedding component for mappings, eventing, etc.

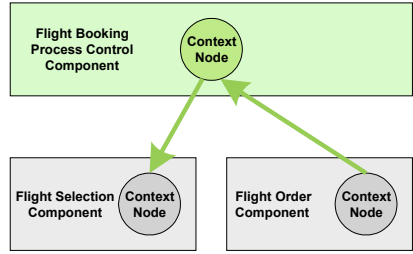
A **configuration controller** contains data that is related to the configuration of the comp.



# Web Dynpro Components - Reverse Context Mapping

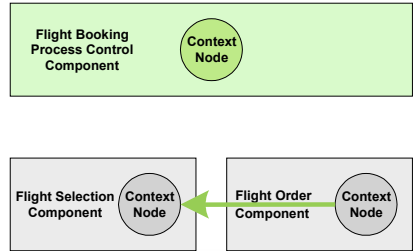
## Reverse Mapping

- Embedding Component Maps (Interface) Contexts of Embedded Components to itself
- Automatic data transfer from Data Source to Data Sink



## Direct Embedded Component Mapping

- It is also possible for the Embedding Component to connect Data Source and Data Sink directly



# Web Dynpro Components – Example



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## Web Dynpro Patterns in One Statement

*Web Dynpro supports pattern-based user interface development, which boosts not only the development efficiency but also the user efficiency*



# Web Dynpro Patterns - Benefits

Reusable user interfaces

Central point for enhancements

Unified user interfaces, better usability

Clear separation of backend/frontend logic

Declarative user interface development



# Web Dynpro Patterns – Example

The screenshot displays a web browser window titled "Pattern - SAP Web Dynpro - Microsoft Internet Explorer provided by SAP IT". The address bar shows a URL starting with "http://www1180-51902/wdholerem/Map...". The main content area is divided into two sections:

**Search Results:** A table with columns: Abflugort, Zielort, Kurzbezeichnung der Flr-Abflugzeit, Ankunftszeit, Code der Einzelnummer, Abflugzeit, and Flugnummer. The table contains five rows of flight data.

Abflugort	Zielort	Kurzbezeichnung der Flr-Abflugzeit	Ankunftszeit	Code der Einzelnummer	Abflugzeit	Flugnummer	
FRA	SFO	LH	FRANKFURT	SAN FRANCISCO	0454	10:10:00	17:11:55
SFO	FRA	LH	FRANKFURT	FRANKFURT	0455	15:00:00	06:09:35
FRA	SFJ	LH	FRANKFURT	BERLIN	2402	10:30:00	21:08:57
FRA	SFJ	LH	FRANKFURT	BERLIN	2402	10:30:00	22:01:57
FRA	SFJ	LH	FRANKFURT	BERLIN	2402	10:30:00	25:03:57

**Detail View:** A section titled "Detail" with sub-sections: "General info" (Airline: LUFTHANSA, Connect identification: 2402, Price: 454, Airline identification: LH, Date: 21.03.97, Currency: EUR), "Departure info" (Airport: FRANKFURT, Departure Time: 10:30:00), and "Arrival info" (Airport: SFJ, Arrival Time: 11:30:00). Below this is a "Detail" section for "Überblick Flugbuchungen" with a table for "Buchungsnummer" and "Raucherplatz".

Buchungsnummer	Raucherplatz
00000001	X

At the bottom of the detail view, there is a link: "Contact your pattern group Feedback."





# Web Dynpro Patterns – Example

The screenshot shows a web browser window displaying a flight search application. The main table lists flight details with columns for origin, destination, airline, flight number, departure/arrival times, and prices. The flight from FRA to SFO is highlighted in yellow. Below the table, a 'Detail' section is expanded, showing 'General Info' and 'Departure Info' for the selected flight. The 'General Info' includes Airline (LUFTHANSA), Flight Number (2402), and Price (454). The 'Departure Info' shows the origin (FRA) and departure time (10:30:00). The 'Arrival Info' shows the destination (SFO) and arrival time (11:30:00). Below this, another 'Detail' section is expanded, showing a table with 'Buchungsnummer' (00000001) and 'Raucherplatz' (X).

Abflughafen	Zielflughafen	Kurzbezeichnung der Flucht	Abflugzeit	Ankunftszeit	Code der Einzelzettelnummer	Abflugort	Flugnummer
FRA	SFO	LH	FRANKFURT	SAN FRANCISCO	0454	10:30:00	17:11:55
SFO	FRA	LH	SAN FRANCISCO	FRANKFURT	0455	15:00:00	06:09:55
FRA	SFJ	LH	FRANKFURT	BERLIN	2402	10:30:00	21:09:57
FRA	SAP	LH	FRANKFURT	BERLIN	2402	10:30:00	22:09:57
FRA	SNF	LH	FRANKFURT	BERLIN	2402	10:30:00	25:09:57

**Detail**

**General Info**

Airline: LUFTHANSA  
Connect identification: 2402  
Price: 454

Airline identification: LH  
Date: 21.09.97  
Currency: EUR

**Departure Info**

Airport: FRA  
Departure: FRANKFURT  
Time: 10:30:00

**Arrival Info**

Airport: SFO  
Arrival: BERLIN  
Time: 11:30:00

**Detail**

Buchungsnummer	Raucherplatz
00000001	X



# Web Dynpro Patterns – Example

This screenshot is identical to the one above, showing the same flight search results and detailed view for the flight from FRA to SFO. The 'Detail' section for the flight is expanded, showing 'General Info', 'Departure Info', and 'Arrival Info'. Below this, another 'Detail' section is expanded, showing a table with 'Buchungsnummer' (00000001) and 'Raucherplatz' (X).



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## Summary

SAP brings in **experience with team development** of business applications from the ABAP into the Java world

SAP offers a **integrated and robust infrastructure** for all of your development processes and life cycles

Beside standard J2EE, SAP supports higher-level programming models like **Web Dynpro**

Web Dynpro **Components** break down applications into manageable parts, which can be reused

Web Dynpro supports **pattern-based user interface development**, which boosts not only the development efficiency but also the user efficiency



## Further Information

### → Consulting Contact

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### → SAP Developer Network

<http://www.sdn.sap.com/>

### → Related Workshops/Lectures at SAP TechEd 2003

#### Lectures:

JAVA101 Overview: Java Development Infrastructure

JAVA102 J2EE for ABAP Programmers

JAVA201 Overview of SAP NetWeaver Developer Studio

#### Workshops:

JAVA152 How to Develop Web Dynpro Applications with SAP NetWeaver Developer Studio

JAVA153 Introduction to SAP NetWeaver Developer Studio

JAVA251 How to Develop SAP Enterprise Portal Content with Web Dynpro

JAVA252 Putting it All Together: Business Programming with SAP's J2EE World



## Questions?



# Q&A





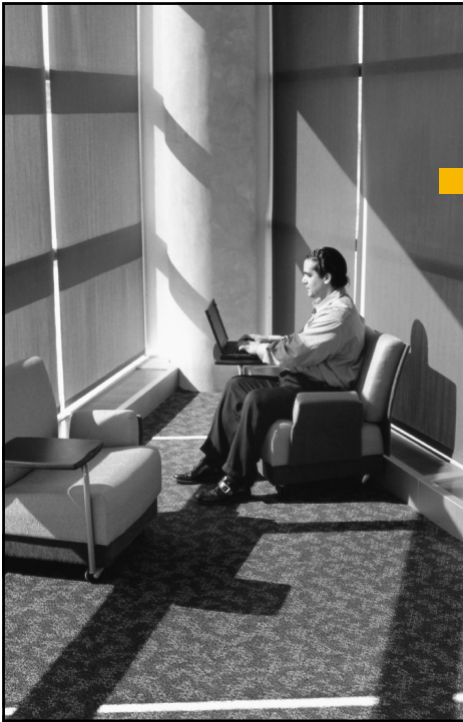
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**Thank You !**

The SAP TechEd '03 Basel Team

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