Fit & FitNesse

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Agenda

- Testing Approaches
- FitNesse tour
- Fit Overview
- Standard Fixtures
- FitNesse
- FitNesse Macros & Features

Manual Testing

- Most expensive testing approach
  - Test takes time and personnel to execute
  - Valid only until the next environmental or code change occurs. And they occur constantly!
  - Error prone as testers get fatigued
  - Not executed often enough to help in development
  - Instructions get outdated and are misunderstood

Acceptance Testing

- Test Features at the end of production
- Pro
  - Bad defects don't ship, fix or delay (both cost)
- Cons
  - Minor defects too late to fix, so they ship
  - Too late to help during programming
  - Expensive and often Manual
  - Takes a long time

xUnit Testing

- jUnit (xUnit for Java) is industry standard
- Pros
  - Test-first design is very powerful
  - Allows for changing requirements
  - Produces better modular design
  - Reduces technical defects
- Cons
  - Most defects are in communication about specs
  - xUnit helps the trees but not the forest

Fit & FitNesse

- Fit
  - Write tests for features directly from the requirements
  - Test high-level and written as html tables
  - Domain Expert can specify fitness criteria
  - Domain Experts can verify fitness criteria
- FitNesse
  - Tool to write and organize fit tests
  - Wiki based for Collaborative web building

Event Scheduling Calendar

- An Event occurs on a date
- An Event belongs to a group
- Add an event to the calendar
  - At startup, should be zero events
  - Create an event
  - Check that there is now one event

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CalendarTests.

AddEventTest

[.CalendarTests] [.FrontPage] [.RecentChanges]

fitnesse.FitFilter

Add an event with a group name.

fit.ActionFixture		
start	xpcinci.ECalendarFixture	
check	countOfEvents	0
enter	eventName	xp-cinci
enter	eventGroup	programming
enter	eventDate	04Mar2003
press	create	
check	countOfEvents	1
check	countOfGroups	1
check	groupsTop	programming

Add another event with same group name

* should only have one group

fit.ActionFixture

Green

Results

CalendarTests.

AddEventTest

Note: Ouput from Standard Error was captured during execution. You may view it by visiting the ErrorLog
[.CalendarTests] [.FrontPage] [.RecentChanges]
fitnesse.FitFilter

Add an event with a group name.

fit.ActionFixture		
start	xpcinci.ECalendarFixture	
check	countOfEvents	0
enter	eventName	xp-cinci
enter	eventGroup	programming
enter	eventDate	04Mar2003
press	create	
check	countOfEvents	1
check	countOfGroups	1
check	groupsTop	programming

Add another event with same group name

Done

Local intranet

Fail

Results

CalendarTests.

AddEventTest

Note: Ouput from Standard Error was captured during execution. You may view it by visiting the ErrorLog
[.CalendarTests] [.FrontPage] [.RecentChanges]
fitnesse.FitFilter

Add an event with a group name.

fit.ActionFixture		
start	xpcinci.ECalendarFixture	
check	countOfEvents	0
enter	eventName	xp-cinci
enter	eventGroup	programming
enter	eventDate	04Mar2003
press	create	
check	countOfEvents	42 *expected* 1 *actual*
check	countOfGroups	1
check	groupsTop	programming

Done

Local intranet

suite

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CalendarTests

Note: Ouput from Standard Error was captured during execution. You may view it by visiting the ErrorLog

fitnesse.fixtures.RecursiveAllFiles	
AddEventTest	8 right, 1 wrong, 0 ignored, 0 exceptions
QueryByDateTest	6 right, 0 wrong, 0 ignored, 0 exceptions
UiCalendarTest	0 right, 0 wrong, 0 ignored, 4 exceptions

fit.Summary	
counts	1 right, 2 wrong, 0 ignored, 0 exceptions
counts run	14 right, 1 wrong, 0 ignored, 4 exceptions
run date	Fri Mar 14 15:42:42 PST 2003
run elapsed time	0:01.42

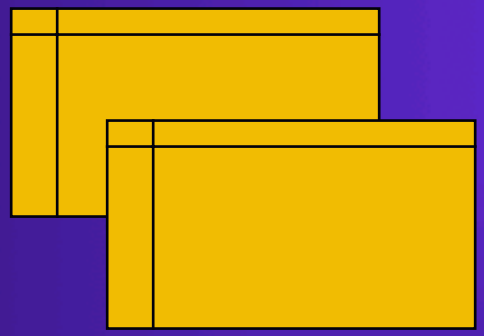
Contents

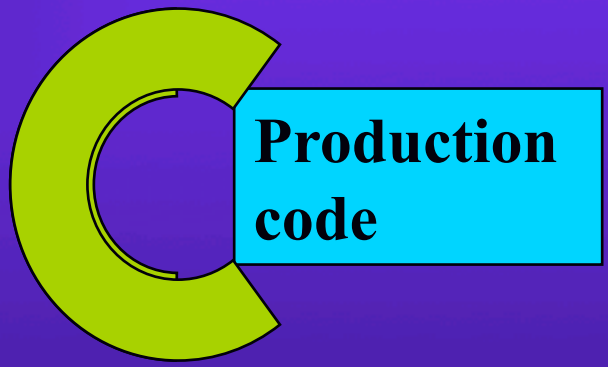
- ClassPath
- PageFooter

Fit: Overview

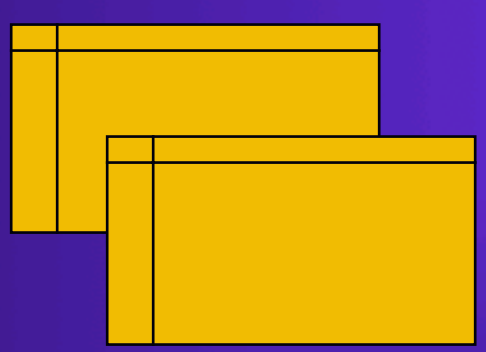
Tests As Html Tables

Fixture to "hold" real code





Web UI Testing



Testing the UI

- GUI is most unstable component
- Minimize Logic in the UI with solid OO design
- Minimize things that can break
- Target UI tests on only what can break
- Test business logic directly elsewhere
- Screen transitions?
- Java Script? (see above)
- Good OO design minimizes Logic in UI
- All that's left is the aesthetics

UI Testing libraries

- HtmlFixture
  - Link: TestUiCalendarDayNames
- IeFixture
  - Uses COM to direct a real IE browser
- HttpUnit
  - Allows low level control
- HtmlUnit
  - Page level control
- jWebUnit / jWebUnitFixture
  - (under development) high level control

Testing The Business Model

Business Domain Testing

- Business language
  - Not tech talk
- Focus on testing the business rules
  - Not loop counters and exception catching
  - Low level stuff is better tested by unit tests
- Scalable
  - Tests scale when they remain atomic
  - No dependencies between test order
  - UI driven testing is more Fragile & Expensive
    - Need to keep windows in sequence.
    - Full Database set-up

Standard Fixtures

- Column Fixture
  - *Each row loads a data structure and then invokes functions upon it.*
- Row Fixture
  - *Each row is a query into an array of objects*
- Action Fixture
  - *Write a script that emulates a user interface.*
- Summary Fixture
  - *Report of all tests on a page*

EventBuild is a Column Fixture

- Column Fixture
  - Operates on a Domain Objects directly
  - Each row loads a data structure and then invokes functions upon it.
  - Uses Domain methods and instance variables
  - Often used for test object creation

Add an event in Feb and March

ft.domain.EventBuild			
name	group	when	created()
xp-cinci	prog	time (daynum 09)(month 01)(year 2004)	true
cinjug	prog	time (daynum 13)(month 02)(year 2004)	true

Eg.Division

- Make sure division that works with positive and negative numbers

eg.Division		
numerator	denominator	quotient()
1000	10	100.0000
-1000	10	-100.0000
1000	7	142.85715
1000	.00001	100000000
4195835	3145729	1.3338196

```
public class Division extends ColumnFixture
{
        public float numerator;
        public float denominator;
        public float quotient() {
              return numerator / denominator;
        }
 }
```

← **Famous Pentium Bug**

Display is a Row Fixture

- Row Fixture
  - Operates on a group of Domain Objects
  - Each row is the data of an object
  - Often used to display results of a query
    - Query either built into the fixture
    - Or preserved in a known static location

Display last Query

ft.domain.Display		
name	groupName()	date()
xp-cinci	prog	09Jan2004
non-group *missing*	prog	09Jan2004

ValueObjects

- An Important Idea in Object Oriented Modeling
- like numbers, dates, monies
- Small objects which are used widely

Row Fixture Example

eg.music.Display					
title	artist	album	year	time()	track()
Scarlet Woman	Weather Report	Mysterious Traveller	1974	5.72	6 of 7
American Tango	Weather Report	Mysterious Traveller	1974	3.70	2 of 7

ActionFixture

- Like a Control panel
- *press* buttons that have particular names
- *enter* values into registers that have certain names.
- *check* the values of named meters

fit.ActionFixture		
start	fitnesse.fixtures.CountFixture	
check	counter	0
press	count	
check	counter	1
press	count	
check	counter	2
enter	counter	5
press	count	
check	counter	6

ECalAction is an ActionFixture

- Action Fixture
  - Write a script that emulates a user interface
  - Add a subclass and Use it directly
  - Define your commands in subclass

Query January Events

fit.ActionFixture		
start	ft.domain.ECalAction	
enter	week	2004,02

Example ActionFixture

fit.ActionFixture		
start	eg.music.Browser	
enter	library	Source/eg/music/Music.txt
check	total songs	37

fit.ActionFixture		
enter	select	1
check	title	Akila
check	artist	Toure Kunda
enter	select	2
check	title	American Tango
check	artist	Weather Report
check	album	Mysterious Traveller
check	year	1974
check	time	3.70
check	track	2 of 7

Summary Fixture

- Displays summary of results of Page
- Add it to TearDown and forget it.

  | fit.Summary |

fit.Summary	
counts	8 right, 0 wrong, 0 ignored, 0 exceptions
run date	Sun Oct 19 14:25:39 PDT 2003
run elapsed time	0:00.32

Putting it all together

- BOC: Build-Operate-Check Pattern
  - Link to locally running FitNesse server
  - Testing the eCal application

CalendarTests.TestQueryByWeekNumbers

FitNesse File Structure

- FrontPage
  - FitNesse
    - UsersGuide
    - (Self tests)
  - CalendarPaths (macros defined here)
    - ClassPath (classpath set here)
    - CalendarTests (root of all tests)
      - PageFooter
      - PageHeader
      - SetUp
      - TearDown
      - TestMoveScheduler
      - TestMoveSchedulerYearBoundry

Test Suite

- Executes all tests in the Sub-Wiki (Tree of Pages)
- **SetUp** and **TearDown** pages invoked for each page of the suite.
- To wrap an entire suite, define the operations on pages named **SuiteSetUp** and **SuiteTearDown**.

SuiteSetUp
SetUp TestOne TearDown
SetUp TestTwo TearDown
SetUp TestThree TearDown
SuiteTearDown

Editing FitNesse Pages

- Simple syntax
- Tables can be created very easily.
- Vertical stroke as the first character of the line, and separate each table cell with it:

```
|Alpha|
|Beta|gamma|Delta|
|1|2|3|
```

Alpha		
Beta	gamma	Delta
1	2	3

Link: FitNesse.MarkupTable

Headers

Headers are created by prefixing a line with !1 or !2 or !3

Markup Text	Displayed as
!1 Title	**Title**
!2 Header	**Header**
!3 Second Header	**Second Header**

FitNesse Macro Language

- !contents
  - Expands into links to sub pages
- !include
  - Include other pages
  - Handy when building test objects
- !path
  - Used in ClassPath page to define a path to class and jar files
- !define
  - Defines macros that can be referred to in sub pages

Example of Macros

```
!2 Macros defined on this page (click Edit)
!define xpcinci (http://localhost:9090/ECal)
 * defined xpcinci (${xpcinci})
!define eCalDir {d:\eclipse21\workspace\ecal}
 * defined eCalDir ${eCalDir}
!define I {\}
 * defined path separator: ${I}
   * "'\ for Windows,  / for Unix'"

!2 Contents
!contents

Link:  CalendarPaths
```

Macros defined on this page (click Ed

- defined xpcinci (http://localhost:9090/ECal)
- defined eCalDir d:\eclipse21\workspace\ecal
- defined path separator: \
  - **\ for Windows, / for Unix**

Contents

- CalendarTests
- ClassPath
- ConfigNotes

Installation

- Download from www.Fitnesse.org
- Unzip into a directory
- Cd to directory and type:

  C:> run

- Open a web browser on:

  http://localhost

Note: You can pick a different port with the *-p* command line option

Command line or Ant script

```
<exec executable="java"
      resultproperty="fit.result">

  <arg line="-cp ${lib}/fitnesse.jar
     fitnesse.TestRunner
     http://localhost/CalendarTests?suite="/>

</exec>
```

Additional FitNesse Features

- Page Versioning
- Recent Changes
- Search for keyword
- Search for page references
- Refactor (rename & delete)
- Virtual Wiki
  - Run local code still under development
  - Using a central set of shared Test pages
  - Helpful in testing code before check-in

Big Picture Stuff

- Plays well with other Best Practices
  - Automated build systems
  - OO Design Patterns
  - jUnit
  - Domain Driven Design
  - Iterative development

Summary

- FitNesse allows for Testing of UIs
  - However, UI testing is fragile and late
- FitNesse also allows Domain Object Testing which is not fragile
- Provides migration path from UI to Domain testing
- FitNesse allows human readable comments to be mixed in with test tables
- And allows easy interpretation by domain experts

Getting Started

1. FitNesse as a Wiki
   - Excellent group communication device
2. FitNesse testing of new project
   - Concurrent with requirements gathering
   - And Domain design
3. FitNesse testing existing projects
   - UI driven with IeFixture and other UI techniques and fixtures
4. FitNesse 2-day Workshop or Mentoring

Perfection: Fitness Testing