

Test Driven Requirements

Phil Robinson

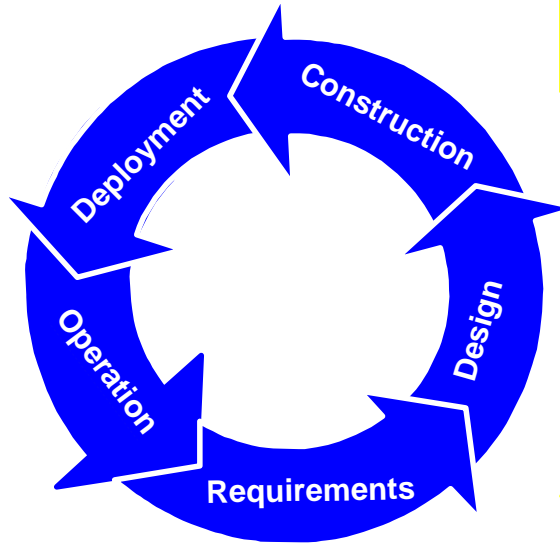
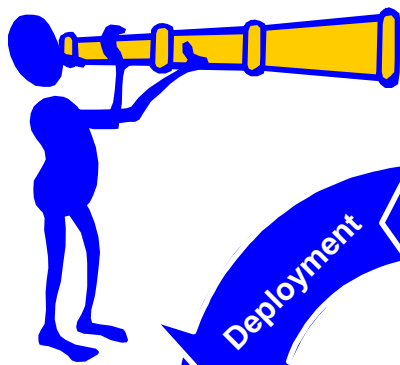


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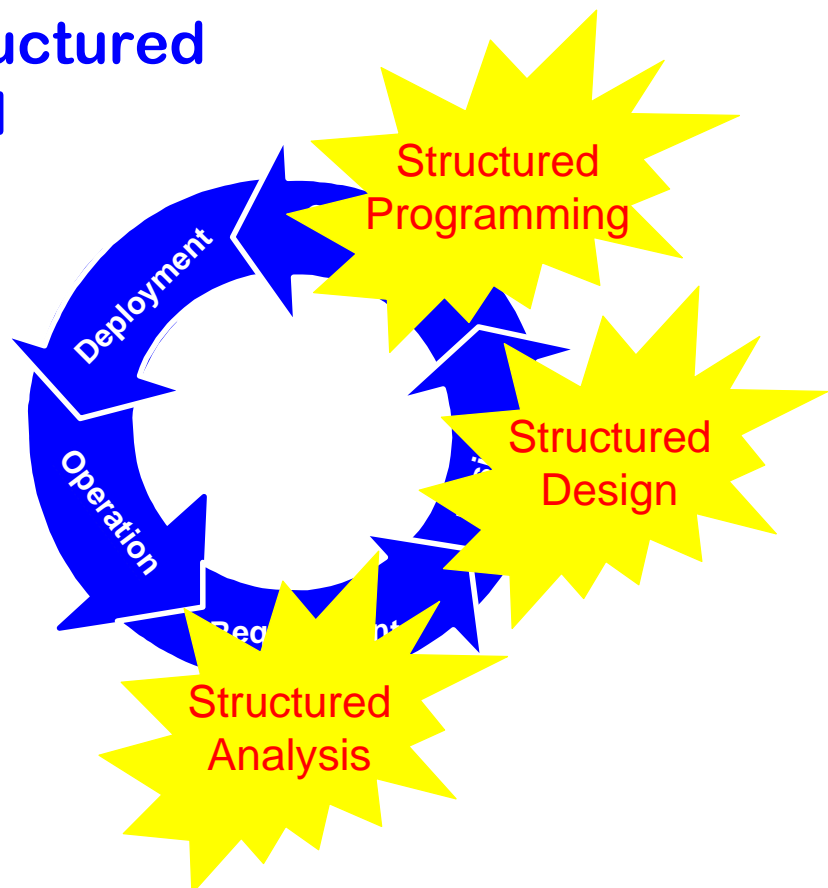
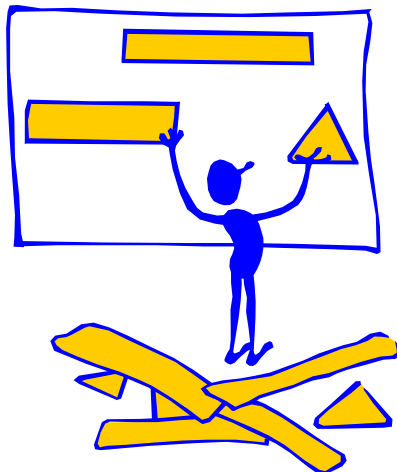
Software Development Trends

The Software Development Life Cycle

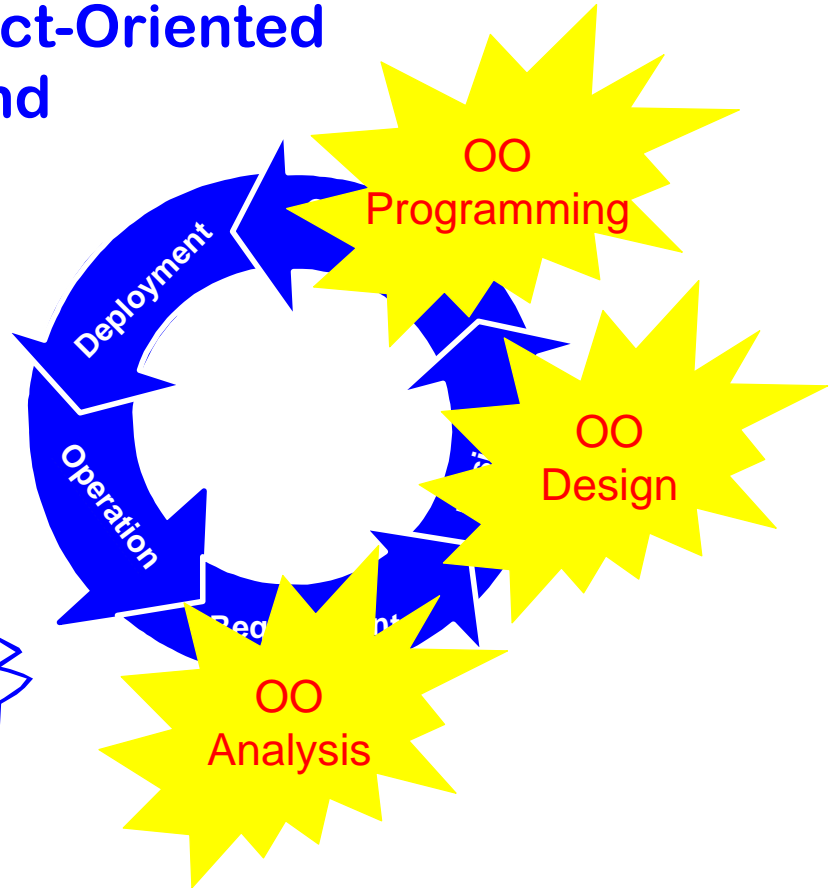


Trends propagate backwards through the development life cycle

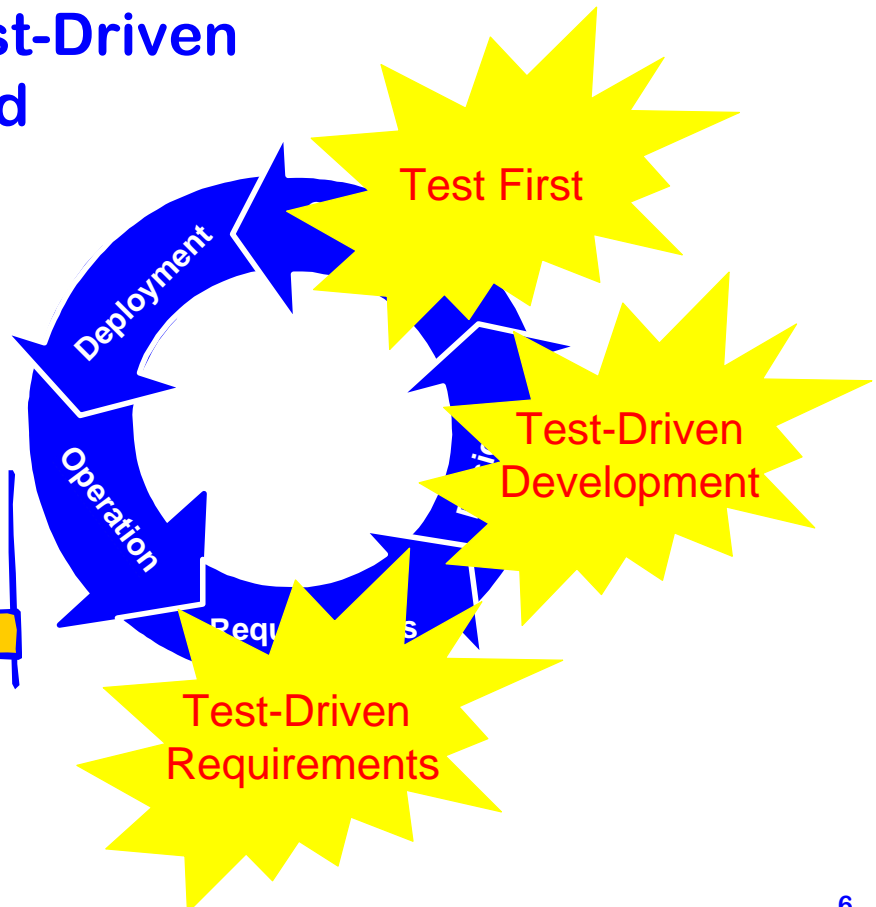
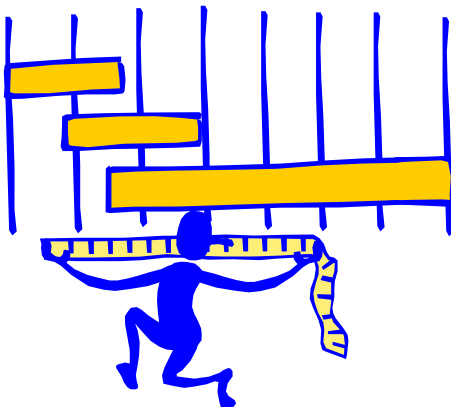
80's The Structured Trend



90's The Object-Oriented Trend

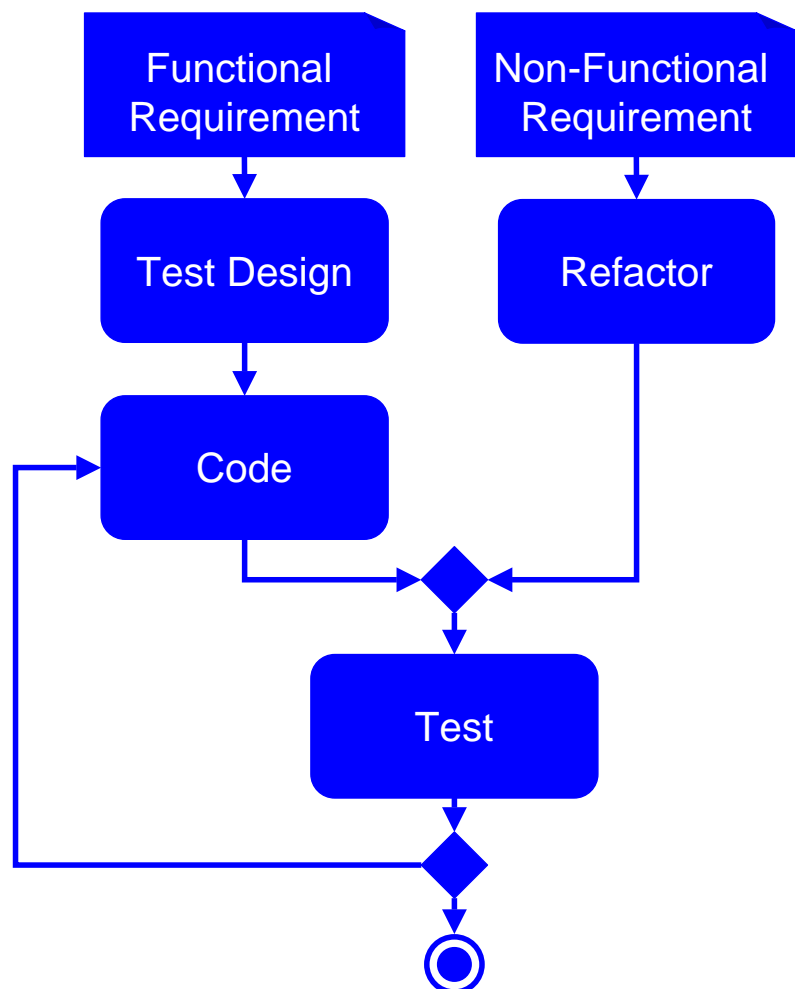


00's The Test-Driven Trend



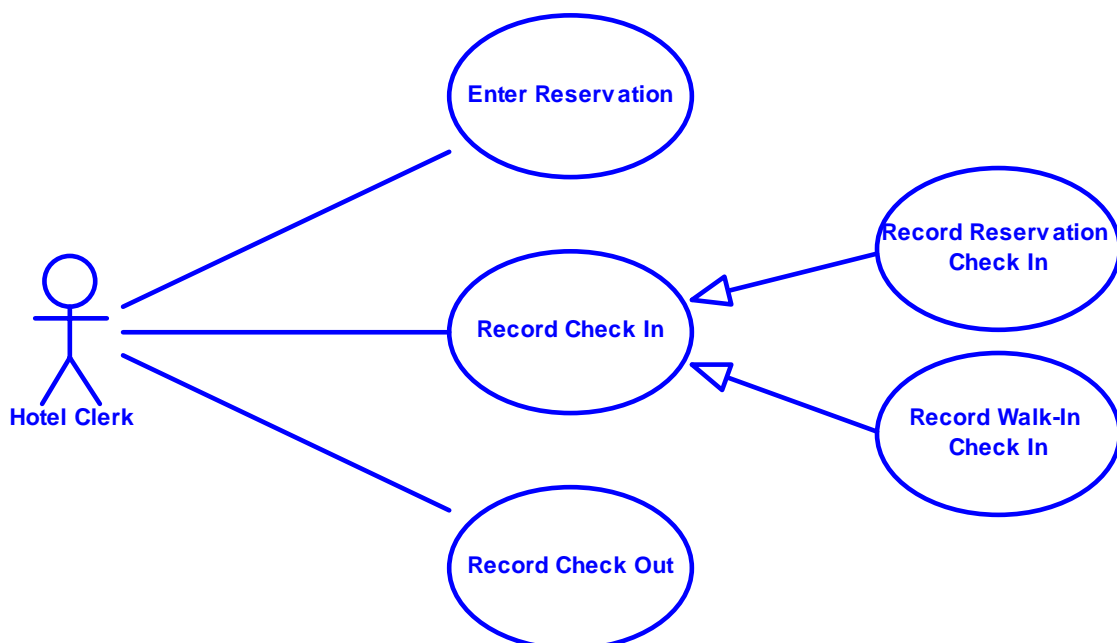
Brief Overview of Test-Driven Development

Test-Driven Development



Requirements

Use Case Model Hotel



Use Case

Record Check Out

Main Scenario

1. The hotel staff enter the guest's room number
2. The system displays the guest's stay details
3. The system calculates the room charge

Alternate Scenarios

- a) **Late check out and no prior arrangement at step 3**
 - a1. The guest is charged for an extra night
- b) **Check out the same day as check in at step 3**
 - b1. The guest is charged for one night

Business Rules

number of nights = today's date - check in date

room charge = number of nights x room rate

Normal check out time is 12pm

Guests may request a later check out time

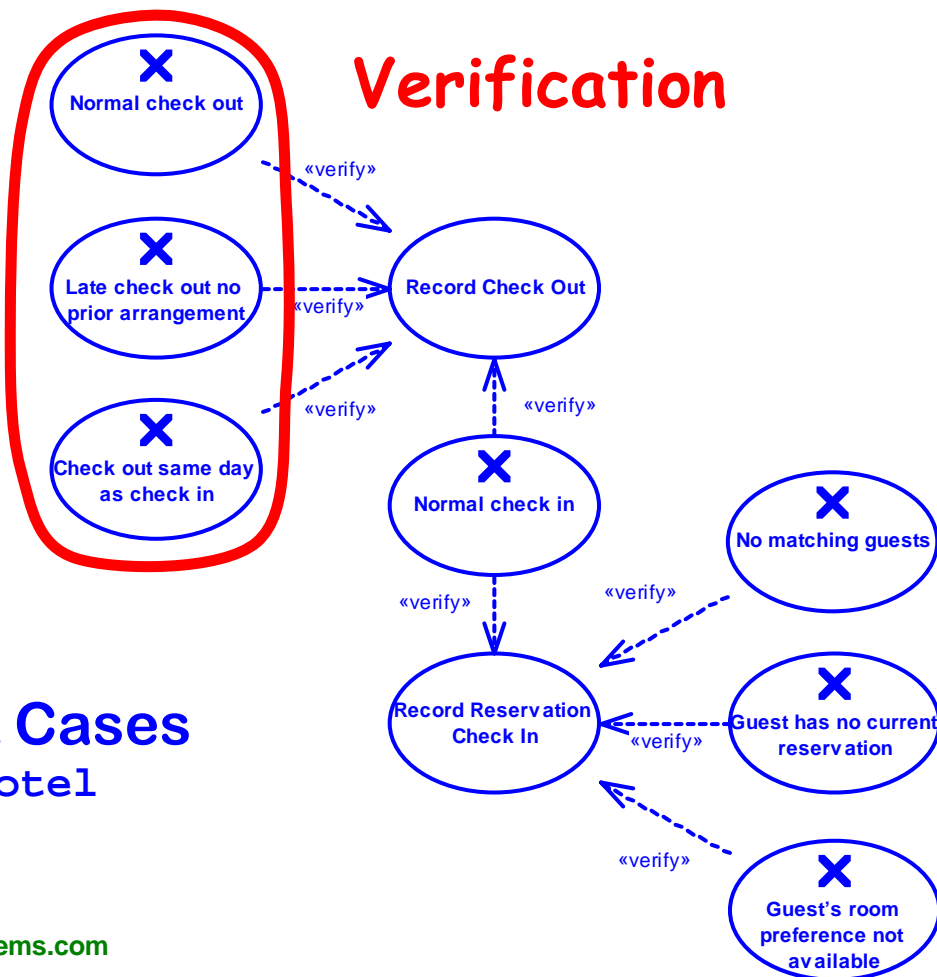
Late check outs must be before 6pm



Validation

11

Testing Requirements



Test Cases Hotel

Today = 17/8/2006

Requirements Verification Record Check Out

Check in date	Checkout time	Late checkout time	Room rate	Charge	Comment
12/8/2006	11:30 am	None	\$120	\$600	Normal check out
12/8/2006	5:30 pm	None	\$120	\$720	Late check out no prior arrangement
17/8/2006	11:30 pm	None	\$120	\$120	Check out same day as check in

In-Depth Testing

- **Maximum length of stay?**
- **Maximum and minimum room rates?**
- **Check out same day as check in**
 - **With late check out no prior arrangement?**
 - **Check in after 12pm?**

Test Case Design Techniques

Test Case Design Techniques

Black-box

- Equivalence partitioning
- Boundary value analysis
- Syntax testing
- Decision table testing
- State transition testing
- ...

Glass-box

- Statement testing
- Branch/decision testing
- Condition testing
- Linear code sequence and jump (LCSAJ) testing
- Basis path testing
- Data flow testing
- ...

Equivalence Partitioning

Hotel Check Out

Check in date



Charge



Late check out time



Today = 17/8/2006

Equivalence Partitioning

Hotel Check Out

Test Case	Partitions	Check in date	Checkout time	Late checkout time	Room rate	Charge	Comment
1	1,4,10,13,18	8/7/2006	11:30 am	None	120	4800	Invalid check in date
2	2,4,10,13,17	12/8/2006	11:30 am	None	120	600	
3	3,4,10,13,15	27/8/2006	11:30 am	None	120	-1200	Invalid check in date
4	2,5,10,13,17	12/8/2006	5:30 pm	None	120	720	
5	2,5,8,13,17	12/8/2006	2:30 pm	3:00 pm	120	600	
6	2,6,8,13,17	12/8/2006	4:30 pm	3:00 pm	120	720	

Equivalence Partitioning

Hotel Check Out

Today = 17/8/2006

Who "tests the test cases"?

Test Case	Partitions	Check in date	Checkout time	Late checkout time	Room rate	Charge	Comment
7	2,4,7,13,17	12/8/2006	11:30 am	10:00 am	120	600	Invalid late check out time
8	2,5,9,13,17	12/8/2006	2:30 pm	8:00 pm	120	720	Invalid late check out time
9	2,4,10,11,15	12/8/2006	11:30 am	None	-120	-600	Invalid room rate
10	2,4,10,12,16	12/8/2006	11:30 am	None	10	50	Invalid room rate
11	2,4,10,14,18	12/8/2006	11:30 am	None	240	1200	Invalid room rate

- Confirms agreement of test outcomes

- Expected
- Actual

- Human test oracle

- Stakeholders
- Users
- Business analyst

Test Oracle

- Automated test oracle

- Spreadsheets
- Automated test frameworks and tools

The screenshot shows a Microsoft Excel spreadsheet titled 'hotel.xls'. The spreadsheet contains a table with columns for 'No', 'Checkin Date', 'Checkout Time', and 'Calculated Charge'. A red box is overlaid on the spreadsheet with the text 'But is this testing or validating requirements?' in red. The spreadsheet data includes dates from 8-Jul-06 to 12-Aug-06 and various calculated charges.

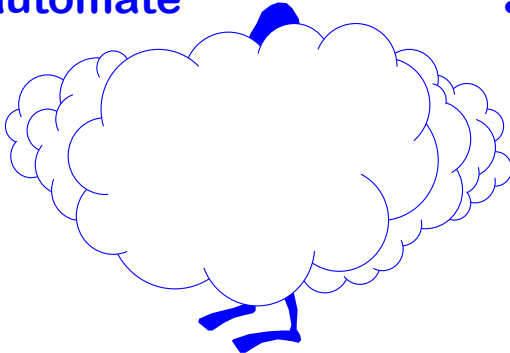
No	Checkin Date	Checkout Time	Calculated Charge
1	8-Jul-06		\$4,800.00
2	12-Aug-06		\$600.00
3	27-Aug-06		-\$1,200.00
4	12-Aug-06		\$720.00
5	12-Aug-06		\$600.00
6	12-Aug-06		\$720.00
7	12-Aug-06		\$600.00
8	12-Aug-06		\$720.00
9	12-Aug-06	11:30 AM	None
10	12-Aug-06	11:30 AM	None
11	12-Aug-06	11:30 AM	None

Test-Driven Requirements

Requirements vs. Test Cases

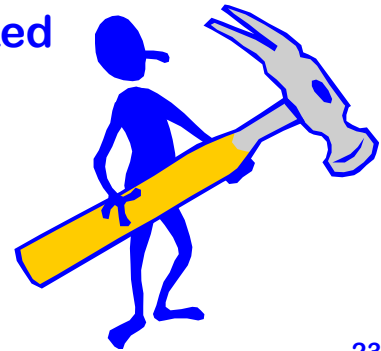
Requirement

- Abstract
- “What should be”
- Validated by stakeholders
- Validation difficult to automate

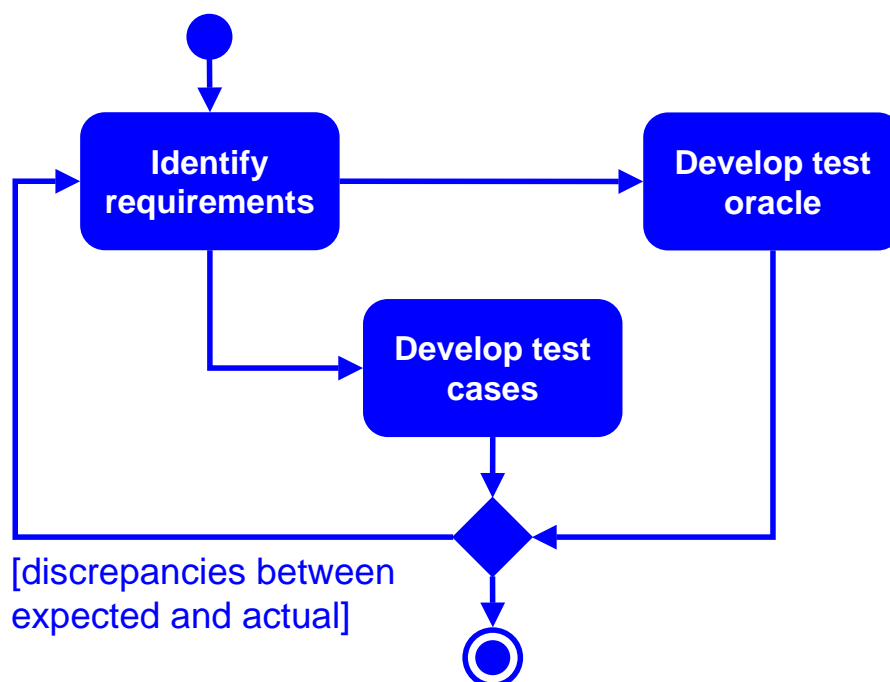


Test Case

- Concrete
- “What should be
- “What should not be”
- Validated by test oracle
- Test oracle can be automated



Test-Driven Requirements

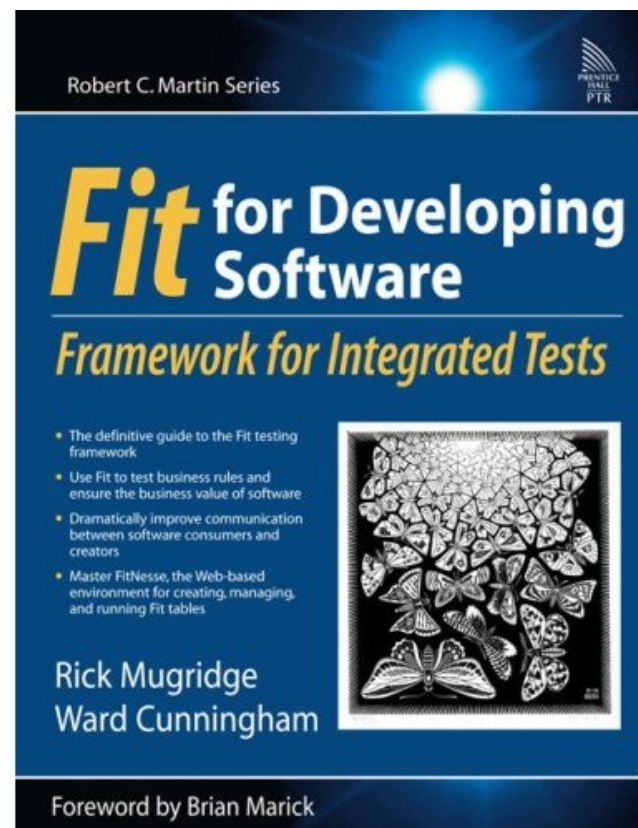


FIT

Automated Test Framework

Framework For Integrated Tests (FIT)

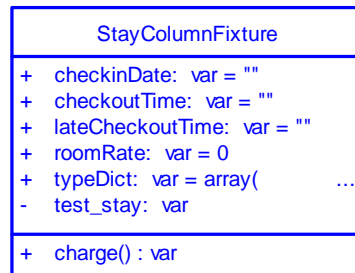
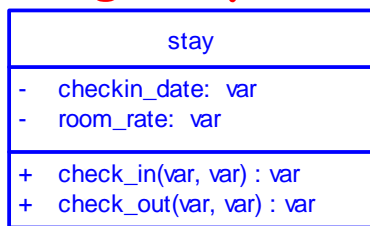
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HTML table

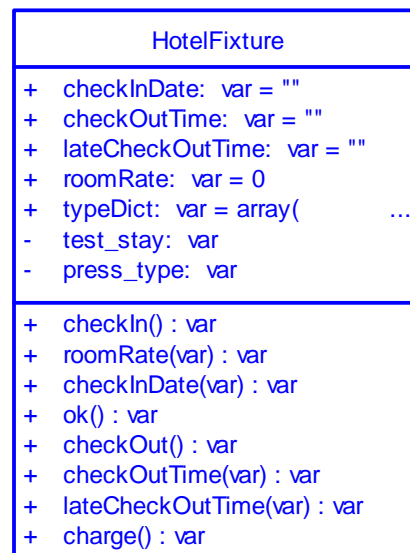
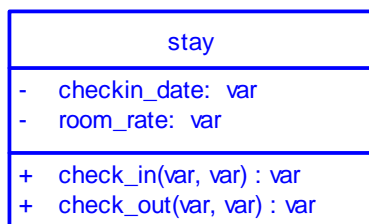
checkinDate	checkoutTime	lateCheckoutTime	roomRate	charge()
1/07/06	11:30 AM	None	85	error
18/07/06	11:30 AM	None	250	error
12/08/06	11:30 AM	None	85	425
12/08/06	12:30 PM	None	85	510
12/08/06	11:45 PM	11:30 AM	85	error
12/08/06	2:15 PM	2:30 PM	85	425
12/08/06	2:15 PM	7:30 PM	85	error
12/08/06	7:30 PM	2:30 PM	85	510
12/08/06	11:30 AM	None	-85	error
16/08/06	11:30 AM	None	10	error
22/08/06	11:30 AM	None	85	error

Target system



Test fixture

start	eg.HotelFixture	
press	check in	
enter	room rate	85
enter	check in date	12/08/06
press	ok	
press	check out	
enter	check out time	11:30 AM
enter	late check out time	None
check	charge	426
press	ok	



Questions?

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