OODP– Session 11

Session times

PT	– Thursday 18:00-21:00	room: Malet 404,405
FT	- Tuesday 13:30-17:00	room: Malet 404

Email: oded@dcs.bbk.ac.uk

Web Page: http://www.dcs.bbk.ac.uk/~oded

Visiting Hours: Tuesday 17:00 to 19:00

Online Survey

This year the student feedback survey has had upgrade and is done on the net.

https://www.survey.bbk.ac.uk/oodp

This Session

1. Software development life cycle from a birds eye
2. Environments
3. Gluing the pieces together

...

Concluding Remarks

Training **you** costs your future employer **money**

"Really?"

"But I already know how to program in

C, C++, Java, Ruby, Z, Scala, Groovy,…"

Of course you do!

Regretfully in real life

the software development life cycle requires

much more than just programming!

"Why is the software development life cycle (SDLP) so complex?"

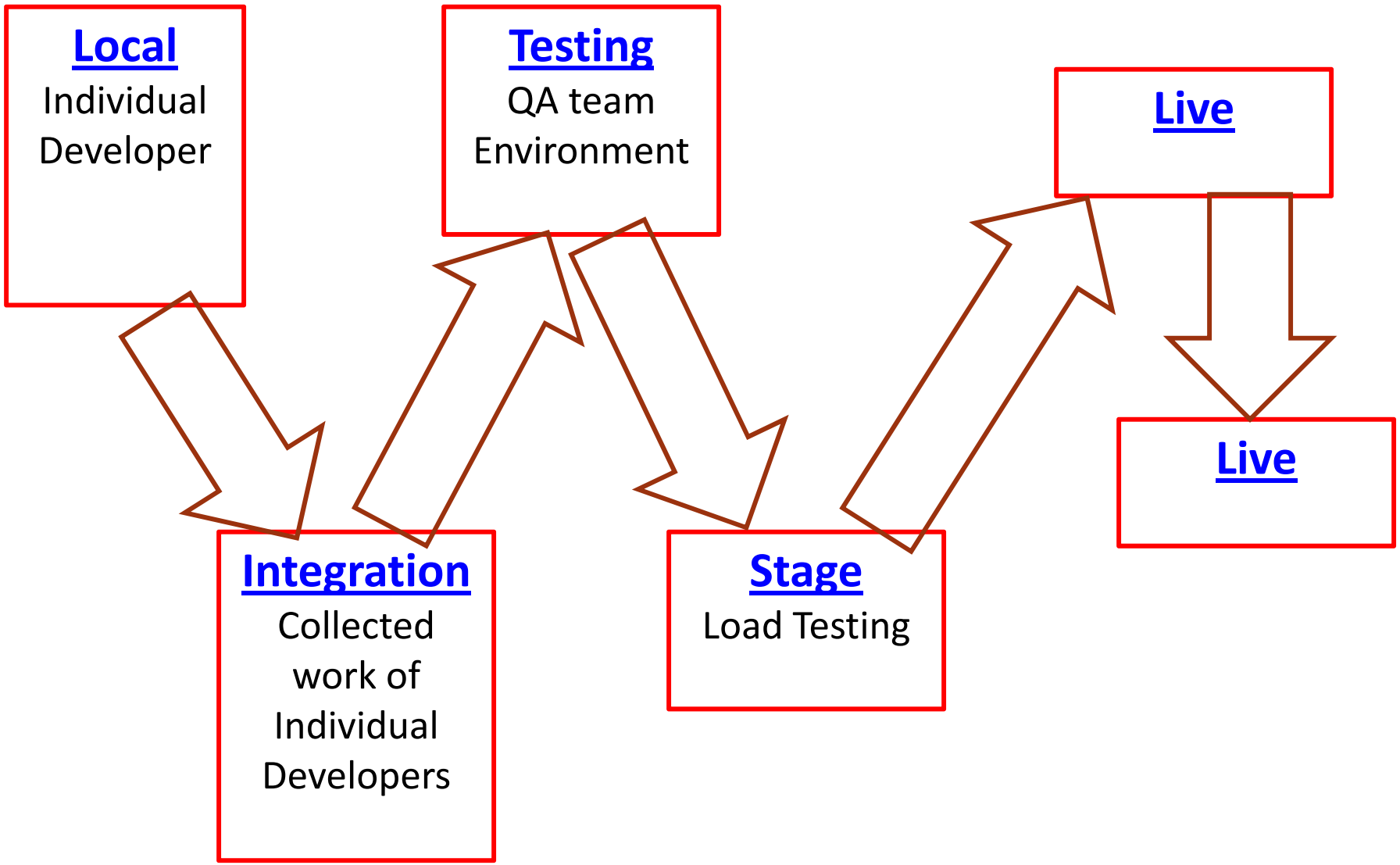
Actually the complexity of the manufacturing process depends on the requirements.

For example the **Financial Services** industry in general has

- Extremely large projects
- Extreme demands on software reliability
- Extreme deadlines


The SDLC Galaxy

Environments (how is software born?)



“Why are these environments needed?”

Actually they might not be needed.

- The software manufacturing process depends on the goals and for different goals may have a different set of environments

This specific manufacturing process was selected because it is close to that used in the financial sector

“Why is this good for their goals?”

- Hopefully in the near future you will know

How do the environments differ?

- Goal
- Teams
- Tools
- Location
- Generality
- …

Local Environment

- Goal: Software Development
- Teams: You
- Tools: IDE, Version Control, Unit Testing
- Location: your work station or a local server
- Generality: Mock world
- …

Integration Environment

- Goal: Software Integration, General Testing
- Teams: Programmers
- Tools: Automated Build tools, Integration Server
- Location: Dedicated hardware
- Generality: from pseudo real world to real world
- …

Testing Environment

- Goal: Functional Testing
- Teams: Test Team
- Tools: Functional testing tools, Cucumber etc.
- Location: Dedicated servers
- Generality: real will world without the “stress”
- …

Stage Environment

- Goal: Load Testing
- Teams: Load Team
- Tools: Heavy weight simulator
- Location: Dedicated servers
- Generality: As close to the real world as possible
- …

Live Environment and Live Environment

- Goal: **Money**
- Teams: Operators
- Tools: Software deployment tools, Smartfrog
- Location: live servers
- Generality: REAL WORLD!
- …

“So many details already, do you expect us to remember everything”?

1. The manufacturing process is usually optimized, everything is done for a reason. So it is easier to remember.

2. This knowledge may come handy in job interviews, (motivation helps memory).

Problem: A good interviewer sees beyond the buzz words.

Problem: "A good interviewer sees beyond the buzz words"

Solutions:

1. Try to use as much of this process as possible in your masters project – this may seem an overkill, but the goal is to put content behind your buzzwords (don't overdo)

2. Same as (1) but with a project of your own. Such projects show that you are able to work autonomously, some employers find this to be a very important quality (note that this is not the opposite of team player)

3. Contribute to an open source project

One critical detail to remember before we go on!

Automation

As much as possible.

Why?

- Saves money
- Lower probability for human error

SDLC

The Code Entry Point

The Code Entry Point

The software development cycle does not start with code, except maybe in *extreme* cases.

It starts in the design stage – mentioned in OODP and other modules

How do you develop software?

Me?

I write the code,

all of it

compile

AND IT WORKS

EVERY SINGLE TIME

(that is why I teach)

You?

Test Driven Development (TDD)

Philosophy

- Untested code is “not code”
- Short development cycle
- Testing is understanding

TDD implementation

Wish List

- Easy to upgrade code (refactor)
- Dedicated testing tools
- Friendly version control

Your bosses wish list

- Automated code style enforcement

Tool Types

- IDE – Integrated Development Environment
- Version Control
- Tools for testing by simulation
- Code coverage
- Mock Libraries
- Static Analysis
- Debugging
- Profiling
- Compilers
- Interpreters
- Build Tools

IDE – Integrated Development Environment

- A long long time ago all the tools were separate.
- Since then things have changed.
- The IDE integrates many (but not all) of them into one big GUI.
- The goal is to save the time wasted on switching between the tools.
- Note that achieving such a goal is highly non-trivial

Version Control

- A big project can easily have thousands of different files.
- Many of these files may be the responsibility of more than one person
- There might even be different version of the same project

This may cause a variety issues:

- Contradicting changes
- Wrong selection of files

Version control is there to resolve such issues.

Unit Testing

- When describing TDD we mentioned the emphasis on Testing every little piece of code.
- One way to do this is to simply write a program that uses the code you have written.

Issue: this program is not an active part of the final product

Solution: Automate the process of writing such programs –

unit test are created in a semi automatic way

Mock Libraries

- Semi automatically generating unit test is great.
- But, what if testing requires access to things that have not been written yet, for example: Databases, Proxy Servers…

Mock libraries contain pre-prepared objects that mock the behaviour of such objects.

Code Coverage

How do you know you have tested enough.

(At least in theory it seems you never know)

However one popular metric is code coverage.

The idea is to check for example

- All lines of code were executed
- All conditions in the code evaluated to every possible value

Naturally this process is automated.

Static Program Analysis

Analyzing the program without executing it

Tool types:

- **Check coding style**
- Formal verification – prove mathematically that your code has no bugs!
- Reverse engineer

Debugging

- A test has failed now it is time to find out why.

(ideally just go back to the latest version that worked and rewrite)

- During the debugging process one wants to stop the program at certain lines, query values of variables etc.

Naturally this process is automated.

Profiling

- All the tests passed Great?
- Program execution takes forever %^£&”!
- Where is all the time wasted?

Naturally this process is automated.

Build

- We have been talking about testing
- However it is not necessarily trivial to get there

- Building a running program may require more than just pressing a button.

Build tools are the in order to simplify and automate

Tool Types

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Integration

Where individuals become a team

Integration

Where all the code goes to (and also the unit tests)

Here things can really go wrong

When things do go wrong we want to minimize the damage!

Continuous Integration

Integrate code as soon as possible.
Why?

Each time only a small portion of code is added or changed. As a result

- Problems are detected earlier
- Easier to find the problem

Continuous Integration

How?
Automatically of course.

- Once a programmer finishes working on a piece of code he uses the version control to incorporate it into a repository .
- The repository is automatically sampled by a continuous integration server. Once the server detects change it goes into action.

Continuous Integration Server

Change detected.

- Build project (usually on dedicated servers)
- Run unit tests
- Run integration tests
- Run …
  - Send reports to relevant team members by **e-mail**

All automatically
(sometimes doing a job that required to people)

Choosing the Tools

Open Source Vs Proprietary

- "Cheap"
- "Un – Reliable"
- "Support"
- Open Source
- Flexible
- *It's your fault*

- "Expensive"
- "Reliable"
- Dedicated Support
- Source Hidden
- Tailored
- *Some one to blame*

Open Source Vs Proprietary

- GUI might not be so nice
- *Open Source enables one GIANT integrated design environment*

- Nice GUI
- *Starting to integrate with open source IDEs*

"Support"

List of tools you can find in the ISE tool modules taught last term

Eclipse Indigo - IDE

Netbeans - IDE

GIT - Version Control

JUnit 4 - Unit Testing

Corbetura - Code Coverage

PMD - Code Style

CheckStyle - Code Style

FindBugs - Code Style

Jupiter - Code Style,

Bugzilla - Bug-Tracking System

Trac -Issue tracking system

Maven - software project management

Ant - build of Java applications

Jenkins -Continuous integration server

“Epilogue”

Concluding Remarks

It is important to remember that the SDLC is a huge evolving galaxy.

Different companies may have extremely different software life cycles (even the same company)